

ANCIENT STRUCTURES

**Remarkable Pyramids, Forts, Towers,
Stone Chambers, Cities, Complexes**

Compiled by:

William R. Corliss



A CATALOG OF ARCHEOLOGICAL ANOMALIES

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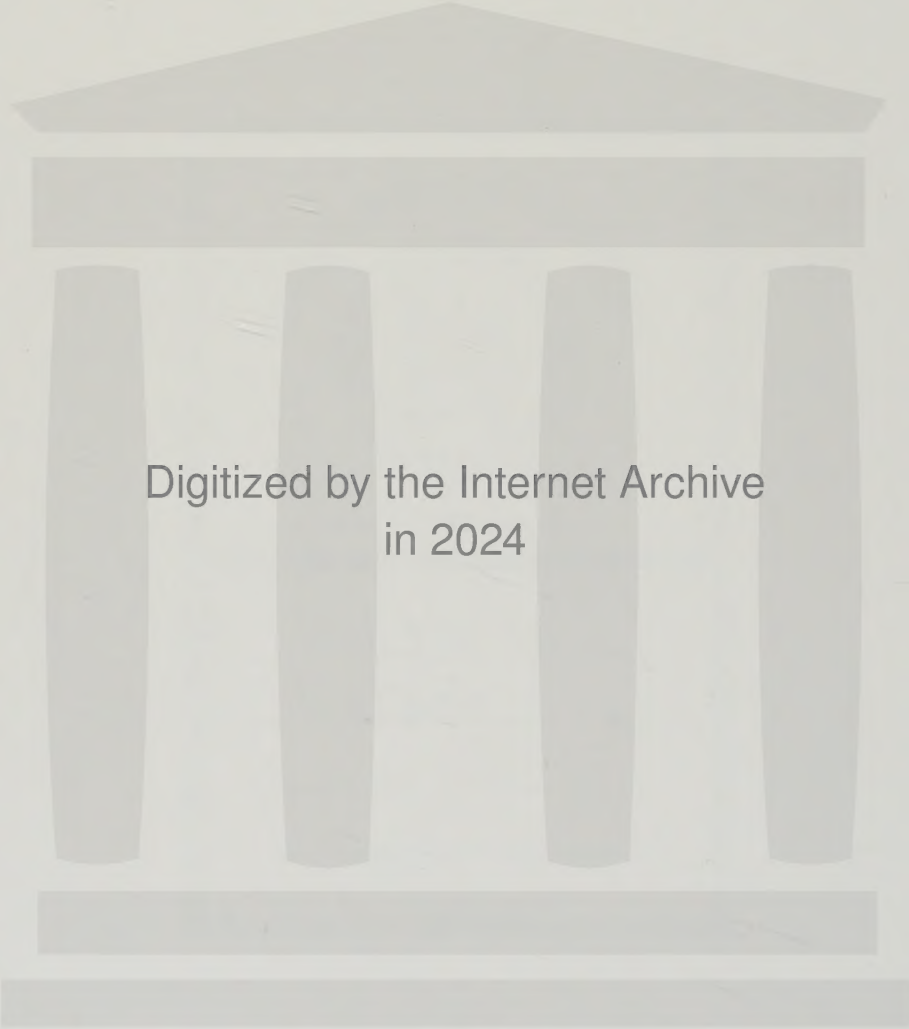
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Published and Distributed by:

The Sourcebook Project

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Glen Arm, MD 21057

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Rare Halos, Mirages, Anomalous Rainbows (category GE)

The Moon and the Planets (categories AE, AH, AJ, AL, AM, AN, AP, AR, AU, AV)

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Carolina Bays, Mima Mounds, Submarine Canyons (category ET)

Anomalies in Geology (category ES, in part)

Neglected Geological Anomalies (category ES, in part)

Inner Earth: A Search for Anomalies (categories EC, EQ, ES in part, EZ)

Biological Anomalies: Humans I (category BH, in part)

Biological Anomalies: Humans II (category BH, in part)

Biological Anomalies: Humans III (category BH, in part)

Biological Anomalies: Mammals I (category BM, in part)

Biological Anomalies: Mammals II (category BM, in part)

Biological Anomalies: Birds (category BB)

Ancient Infrastructure (category MS in part)

Ancient Structures (category MS in part)

HANDBOOKS:

Handbook of Unusual Natural Phenomena

Ancient Man: A Handbook of Puzzling Artifacts

Mysterious Universe: A Handbook of Astronomical Anomalies

Unknown Earth: A Handbook of Geological Enigmas

Incredible Life: A Handbook of Biological Mysteries

The Unfathomed Mind: A Handbook of Unusual Mental Phenomena

SOURCEBOOKS:

Strange Phenomena (vols. G1 and G2)

Strange Artifacts (vols. M1 and M2)

Strange Universe (vols. A1 and A2)

Strange Planet (vols. E1 and E2)

Strange Life (vol. B1)

Strange Minds (vol. P1)

NEWSLETTER:

Science Frontiers (bimonthly anomaly reports)

WEB SITE:

www.science-frontiers.com

COMPILATION:

Science Frontiers: Some Anomalies and Curiosities of Nature
(first 86 newsletters organized and indexed)

For availability, prices, and ordering procedures write:

SOURCEBOOK PROJECT

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PREFACE

After more than thirty years of scouring the scientific and semiscientific literature for anomalies, my major observation is that the search has been most fruitful. In fact, I have wondered why the scientific community itself has not been systematically compiling such information. It is surprising that a Catalog of Anomalies does not already exist to guide scientific thinking and research. It is at least as important to recognize what is anomalous as it is to realize what is well-explained in terms of prevailing paradigms. With this outlook and philosophy, here is the nineteenth volume of such a Catalog. It is largely the product of one person's library research. The work has been carried forward entirely through the sale of these Catalog volumes and associated publications.

Under the aegis of the Sourcebook Project, I have already published 35 volumes, totalling roughly 15,000 pages of source material on scientific anomalies. (See page iv for a list of titles.) As of this date, these 35 volumes represent only about 45% of my data base. New material is being added at the rate of about 1,200 new items per year, about 700 of which come from the current scientific literature. This acquisition rate could easily be multiplied several-fold just by spending more time in libraries. Even after thirty years, only a handful of English-language journals have received my serious attention. The journals in other languages, government reports, conference papers, publications of research facilities, proceedings of state academies of science, and an immense reservoir of pertinent books remain almost untapped. Every library foray uncovers new anomalies; the world's libraries are bulging with them.

Given this rough assessment of the extent of the anomaly literature, one can understand why the Catalog of Anomalies will require at least 30 volumes, many of them larger than the one you now hold. I visualize a shelf of these 30 volumes, or an equivalent CD, accompanied by master indexes, to be the logical initial step in providing scientists with access to what, in my opinion, is not well-explained. The underlining of "my" is significant because anomalouslyness is often in the eye of the beholder. It depends upon how well one is satisfied with those explanations based on currently accepted paradigms. In the Catalog of Anomalies, the data rule; all theories and hypotheses are considered tentative. The history of science, from the luminiferous ether to the static continents, demonstrates that this is a wise policy.

Will the Catalog of Anomalies impact science significantly? Probably not---at least not right away. Quite often the initial reaction to the volumes already published has been disbelief and even disdain. The data must be in error; the data are too often anecdotal; the data are too old; the purported anomaly was really explained long ago. Germs of truth reside in such complaints. Some science and some observations reported in the Catalog are certainly bad; but this is minimized by a heavy reliance upon respected journals. In addition, the baseline of well-established theories---against which anomalouslyness is measured---is always shifting. And for every anomaly that can be explained away, a trip to a library will quickly replace it with ten more from impeccable sources. Nature is very anomalous or, equivalently, Nature is not yet well-understood. Much remains to be done in both anomaly research and in the resulting scientific research that will ultimately dispose of these anomalies.

William R. Corliss

**"ROUND ABOUT THE ACCREDITED AND ORDERLY FACTS
OF EVERY SCIENCE THERE EVER FLOATS A SORT OF
DUST-CLOUD OF EXCEPTIONAL OBSERVATIONS, OF
OCCURRENCES MINUTE AND IRREGULAR AND SELDOM
MET WITH, WHICH IT ALWAYS PROVES MORE EASY TO
IGNORE THAN TO ATTEND TO . . . ANYONE WILL
RENOVATE HIS SCIENCE WHO WILL STEADILY LOOK
AFTER THE IRREGULAR PHENOMENA. AND WHEN THE
SCIENCE IS RENEWED, ITS NEW FORMULAS OFTEN
HAVE MORE OF THE VOICE OF THE EXCEPTIONS IN
THEM THAN OF WHAT WERE SUPPOSED TO BE THE
RULES."**

William James

Illustrations initialed JCH are the work of John C. Holden

HOW THE CATALOG IS ORGANIZED

PURPOSE OF THE CATALOG

The Catalog of Anomalies is designed to collect and categorize all phenomena that cannot be explained readily by appealing to prevailing scientific paradigms. Such phenomena are termed "anomalies." Following its definition, each anomaly is rated in terms of: (1) its substantiating data; and (2) the seriousness of the challenge it poses to mainstream paradigms. Next, important examples of the anomaly are recorded, some of the more interesting ones in greater detail. Finally, all the examined references are listed. Thus, the Catalog is a descriptive guide as well as a reservoir of examples of the phenomena along with their supporting references. Science researchers thus have a substantial foundation for beginning further investigations of these intriguing phenomena. In short, the basic purposes of the Catalog are: the collection and organization of the unknown and the poorly explained in order to facilitate future research and explanation.

GENERAL PLAN OF THE CATALOG

It was tempting to organize this Catalog alphabetically, making it an "encyclopedia of anomalies." But many of the phenomena have obscure names or, even worse, no names at all. Under these circumstances, alphabetical access to the data base would be difficult. Therefore, a system of classification was designed based upon readily recognized aspects of nature, such as lightning or mammal morphology. The universe of anomalies is first divided into nine general classes of scientific endeavor, as illustrated in the diagram on the following page. Few people would have difficulty classifying a phenomenon as biological, astronomical, geological, etc. The second, third, and fourth levels of classification are also based upon generally recognized aspects of nature. The similarity of this sort of classification to that employed in natural-history field guides is quite intentional. Like bird identification, phenomenon classification soon becomes second nature. In fact many of the phenomena described in this Catalog are accessible to anyone with normal senses and, particularly in ornithology, a little optical help.

Most catalogs employ numbering systems, and this one is no exception. Rather than use a purely numerical system, the first three levels of classification are designated by letters. The triplets of letters selected have some mnemonic value. Thus, an MSP anomaly is easily recognized as belonging to the archeology class (M); as involving structures (S); and as concerning pyramids (P). The number added to the triplet of letters marks the fourth classification level, so that MSP2 applies to "Comalcalco's curious brick pyramid," as indicated in the diagram on the next page. Every class of anomaly has such a unique alphanumeric code. All cross references and indexes are based on this system. Catalog additions and revisions are made easier with this approach.

These codes may seem cumbersome at first, but their mnemonic value to the compiler has been considerable. The codes are simple, yet they are flexible enough to encompass the several thousand types of anomalies in the several diverse scientific disciplines that have so far been investigated.

A glance through this volume will reveal that each entry for an anomaly type bears an X-number, and each reference an R-number. MSP2-X1 therefore specifies the first entry for "Comalcalco's brick pyramids." MSP2-R1 is the first reference in this section's bibliography.

<u>First-order classification</u>	<u>Second-order classification</u>	<u>Third-order classification</u>	<u>Fourth-order classification</u>
A Astronomy	A Anthropology	A Astronomical Observatories	1 Stone and Brick Pyramids
B Biology	G Graphic Artifacts	B Buildings	2 Comalcalco's Brick Pyramid
C Chemistry & Physics	M Non-graphic Artifacts	C Water-control Structures	3 Temple of the Inscriptions
E Earth Sciences	S Structures	D Menhirs, Dolmens	4 Pyramid of the Sun
G Geophysics		E Excavated Structures	.
L Logic & Math		F Forts	.
M Archeology		H Stone Rows and Circles	.
P Psychology		I Furnaces, Smelters	.
X Unclassified		M Mounds and Cairns	.
		O Carved Rocks, Columns	.
		P Pyramids	.
		R Roads and Bridges	.
		S Cities and Complexes	.
		T Towers	.
		U Chambers and Passage Graves	.
		W Walls, Ditches	.

Bold-face subjects are covered in this volume.

CATALOG CODING SCHEME

HOW DATA AND ANOMALIES ARE EVALUATED

Each anomaly type is rated twice on four-level scales for data "validity" and "anomalousness", as defined below. These evaluations represent only the opinion of the compiler and must be considered only rough guides.

DATA EVALUATION SCALE

- 1 Many high-quality observations. Almost certainly a real phenomenon.
- 2 Several good observations or one or two high-quality observations. Probably real.
- 3 Only a few observations, some of doubtful quality. Phenomenon questionable.
- 4 Unacceptable, poor-quality data. Such entries are included only for purposes of comparison and amplification.

ANOMALY EVALUATION SCALE

- 1 Anomaly cannot be explained by modifications of present laws. Revolutionary.
- 2 Can probably be explained through relatively minor modifications of present scientific laws.
- 3 Can probably be explained using currently popular theories. Primarily of curiosity value.
- 4 Well-explained. Included only for purposes of comparison and amplification.

Referring to the evaluation scales above, it should be remarked that anomalies that rate "1" on both scales are very rare. Such anomalies, however, are the most important because of their potential for forcing scientific revolutions.

ANOMALY EXAMPLES

Examples of anomaly types and the entries discussing them are designated by the letter X in the body of the Catalog. Except in the cases of extremely common phenomena, such as ball lightning, all of the examples discovered so far are entered. If the example is of the "event" type, time and place are recorded if they are available. Such data are the basis of the Time-of-Event and Place-of-Event Indexes, which could in principle lead to the discovery of obscure cause-and-effect relationships. When library research has unearthed a great many examples of a specific anomaly, only the more interesting and instructive are treated in detail. In the examples and entries, direct quotations from eye-witnesses and scientific experts are often employed to convey accurately the characteristics and significance of the phenomena.

THE REFERENCES AND SOURCES

Each anomaly type and the examples of it are buttressed by all references that have been collected and examined. Since some references deal with several examples, each reference includes the X-numbers of the examples mentioned. When a reference covers more than one type of anomaly, it is repeated in each anomaly bibliography. Actually, there is little repetition of this sort in the Catalog.

Perusal of the Source Index will demonstrate that the great majority of the references employed comes from the scientific literature. Heavily represented in this volume of the Catalog are such journals as: Nature, Science, and Antiquity. Some less-technical publications are also used fairly frequently, such as Science News and the New Scientist. All of the serials just mentioned are generally very reliable, although one must always be wary when dealing with anomalous phenomena. In addition to these often-referenced publications, a wide spectrum of other journals dealing with archeology have been found useful here. In contrast to many of the preceding Catalog volumes, books, both scientific and popular, have played an important role here.

The sources consulted date from the beginning of organized science some 200 years ago. The great bulk of the references, however, comes from the past 80 years. In archeology, especially, the explosive growth of the data base is remarkable. Indeed, advances are being made so rapidly in archeology and anthropology that some things printed in this volume will be outdated before the books leave the bindery.

THE INDEXES

Most Catalog volumes conclude with five separate indexes. At first glance this may seem to be too much of a good thing, but in the context of a science-wide endeavor each index helps tie the whole together. It is quite apparent, though, that most archeological phenomena are not of the "event" type. Therefore, the Time-of-Event and Place-of-Event Indexes are not included in the Series-M volumes.

The Source Index shows immediately the dependence of this Catalog upon the scientific literature rather than newspapers and other popular publications. Its real purpose, though, is the rapid checking of newly acquired references to determine whether they have already been caught in the fishing net of the library-research aspect of the Catalog effort. The Source Index is doubly valuable because many footnotes and bibliographies in the scientific literature omit article titles and, sometimes, even authors! The researcher also comes across vague references to such-and-such an article by so-and-so back in 1950 in Nature. In such cases, the rather ponderous Source and First-Author Indexes can help pin down references lacking in specifics.

The three Indexes use the Catalog codes described above rather than page numbers. The codes are permanent whereas page numbers would change as volumes are revised. The mnemonic value of the Catalog codes is evident here, too, because the approximate nature of each Index entry is readily apparent, while page numbers provide only location.

SUPPORTING PUBLICATIONS OF THE SOURCEBOOK PROJECT

The Catalog volumes currently being published are actually distillations of huge masses of source material. The Sourcebook Project has already published 35 volumes of such material, as detailed on p. iv. Phase I of the Sourcebook Project resulted in ten loose-leaf notebooks called "Sourcebooks." To meet the demands of libraries, Phase II supplanted the Sourcebooks with a series of six "Handbooks," which are casebound, much larger, and more comprehensive than the Sourcebooks. Phase III, now in progress, is the cataloging phase. This consists of systematizing the data base, which now comprises some 40,000+ articles, and the publication of the "Catalogs."

CATALOG ADDENDA AND REVISIONS

Over 1200 new reports of anomalies are collected each year from current and older scientific journals. New anomaly types and additional examples of types already cataloged are accumulating rapidly. When sufficient new material has been assembled, Catalog volumes will be revised and expanded.

The Sourcebook Project welcomes reports of scientific anomalies not already registered in extant Catalog volumes. Reports from scientific journals are preferred, but everything is grist for the anomaly mill! Credit will be given to submitters in new and revised Catalog volumes. If the reports are from current literature, they may be mentioned in Science Frontiers, the Project's newsletter. Send data to: Sourcebook Project, P.O. Box 107, Glen Arm, MD 21057, USA.

The Project's web-site address is: www.science-frontiers.com.

MS INTRODUCTION

This volume, the nineteenth in the Catalog of Anomalies, is the second to concern itself with archeology. It focuses on the various buildings and other structures erected by ancient cultures for purposes of habitation, worship, defense, burial, storage, astronomical observations, and so on. Of course, we build structures for the same purposes today; e.g., skyscrapers, churches, missile silos, mortuaries, etc.; but we use steel and concrete rather than rude stones. We also have bulldozers and cranes to move earth and materials. In contrast, the ancient cultures relied mainly on human muscles. Yet, they built well and often with inspiration. The Great Pyramid is still with us after 4,500 years, and it continues to amaze us.

This volume's companion, which is entitled Ancient Infrastructure, is concerned with the structures that undergird ancient cultures: the roads, canals, and defensive walls and embankments. Stone rows, stone circles, and earthen mounds are also consigned to this other volume.

It is reasonable to ask what might be anomalous in the sundry structures mentioned in the first paragraph. First of all, we assume that many ancient cultures had access to large labor forces and plenty of time so that the transportation of multiton stone blocks was not a barrier problem, regardless of what is claimed in many popular books. The properties of structures that do claim the attention of an anomalist are such as follow:

- High degrees of innovation, as in early Subsaharan iron smelting;
- Precocious use of technology and science, as in the acoustical engineering in some passage graves;
- Apparent lack of purpose, as in the intricately carved stones at Tiahuanaco; and
- Unknown identities of builders, as at the Gungywamp complex.

But such properties usually warrant only modest anomaly ratings for they do not directly challenge deeply entrenched dogmas. However, anomaly ratings ascend dramatically when structures imply that:

- The Vikings ventured well beyond Newfoundland;
- There were extensive pre-Columbian contacts between the Old and New Worlds, read "diffusion";
- Vastly superior civilizations preceded our own, read Atlantis and/or the Golden Age; and
- There were advanced cultures in Subsaharan Africa.

Archeologists should not feel singled out by this search for anomalies in their field. The first seventeen volumes of the Catalog of Anomalies treat the disciplines of geophysics, astronomy, geology, and biology in the same doubting, suspicious way. The attitude of the anomalist may seem "bad" to a mainstream scientist, but it is eclectic, value-free, ever-inquiring, and in reality the essence of good science.

MSA ANCIENT ASTRONOMICAL OBSERVATORIES

Key to Phenomena

MSA0	Introduction
MSA1	Notable Observatory Buildings: A New World Survey
MSA2	The Great Pyramid as an Astronomical Observatory

MSA0 Introduction

Observatories are defined here as dedicated buildings incorporating special features, such as apertures, specially positioned windows and doorways, notches, projections, and other sighting devices. These "instruments" were used mainly to mark the solstices, equinoxes, and the risings and settings of particular stars and planets. There seems to be no solid evidence that eclipse prediction was an objective of any of the structures identified here. Observatories may also have hosted ceremonies and had other purposes, but their primary purpose was to serve as observational platforms. Observatories performed the same functions as some of the stone circles, calendar sites, and other dispersed sighting devices cataloged in Ancient Infrastructure.

Except for the Great Pyramid, which may have been a sophisticated astronomical observatory during its construction, all the of observatories cataloged here are found in the Americas. Generally, these New World observatories were rather unsophisticated, boasting just a few apertures with a handful significant alignments. The most impressive observatories were those erected by the Maya, who used them to compile amazingly detailed information on the motion of Venus.

MSA1 Notable Observatory Buildings: A New World Survey

Description. The incorporation of specialized apertures and sighting devices into buildings for the purpose of observing celestial phenomena, such as solstices, equinoxes, and the risings of bright stars. Buildings designed with these astronomically oriented features are termed "observatories," although they may have been multipurpose. Observatories were functionally the same as the dispersed calendar sites, stone circles, etc., as described in Ancient Infrastructure.

Data Evaluation. The professional literature of archaeoastronomy is abundant and of high quality. The major exception in this section concerns claims made for the Kalasasaya at Tiwanaku, where we have found no professional rebuttals of extreme claims. It is also important to add here that it is all too easy to find astronomical alignments for buildings that possess many potential sighting lines when the sky is full of potential significant targets. In other words, some of the claimed alignments may be fortuitous rather than intentional. Rating: 2.

Anomaly Evaluation. The existence of Precolumbian observatories in the New World is considered anomalous only if the astronomical objectives go beyond the simple marking of the solstices and equinoxes and the determination of the lunar month. Eclipse prediction would meet our criteria for anomalousness, but no New World sites seem to have been dedicated to that objective. The only New World observatories that were engaged in advanced astronomy appear to have been the Caracol, at Chichen Itza, and a few other similar Mayan buildings. It is presumed that these observatories helped the Maya obtain their astounding knowledge about the complicated, lengthy cycles of Venus. Our anomaly rating is based solely upon these Mayan particular observatories. Rating: 2.

Possible Explanations. The Maya were fascinated by Venus and its cycles. Consequently, they built sophisticated observatories to chart this planet's motion, from which they derived their unique cosmology.

Similar and Related Phenomena. Dispersed observatories: calendar sites (MSH21); medicine wheels (MSH22); stone circles (MSH7); stone rectangles (MSH20). All the foregoing references are in Ancient Infrastructure.

Entries

X0. Introduction. Prehistoric astronomers employed several methods for measuring the positions and motions of the sun, moon, planets, and stars. In our companion volume, Ancient Infrastructure, we describe the use of stone circles, gnomons, calendar sites, stone rows, building alignments, and other devices employed in pre-telescope astronomy. In this volume, we focus on buildings used primarily as observatories; that is, integral structures built in ways such that the positions of astronomical objects could registered. To this end, these dedicated ancient observatory buildings possessed windows, slits, holes, and other sighting devices located in strategic positions.

For obvious practical reasons, observatory buildings were generally smaller than the geographically extended calendar sites, medicine wheels, stone rows, etc. Observational precision was thereby compromised by building dimensions. In fact, buildings dedicated to astronomical observations are rather rare in antiquity. For some obscure reason, most buildings that qualify as observatories are in the New World. Of course, some Old World buildings, like the Great Pyramid, may have been multipurpose. (MSA2)

The observatory buildings we describe below, interesting though they may be, cannot be considered anomalous. They do not represent great labor, employ giant stones, imply an advanced

understanding of astronomy, or employ innovative technology. They are simply intriguing insights to the thinking and cosmologies of the cultures that built them.

X1. North America.

Utah. Hovenweep Castle is one of the curious stone towers built by the Anasazi. Located in Hovenweep National Monument in southeastern Utah, it is only one of the several hundred related stone towers sprinkled about Utah, Colorado, New Mexico, and Arizona. (See MST2-X1 for details and a photograph.) So-called because of its superficial resemblance to European castles, Hovenweep Castle is generally agreed to be unambiguous evidence that the Anasazi knew well the paths taken by prominent celestial objects, especially the sun.

The archaeoastronomical significance of Hovenweep Castle was not widely appreciated until the field work of R.A. Williamson and coworkers in the 1970s. It was in the "D" tower (named for its "D" shape") that Williamson et al found clear-cut proof that the Castle incorporated an observatory of sorts. In 1978, Williamson wrote as follows.

We know that the original "D" tower of Hovenweep Castle was constructed in about A.D. 1200. Several generations later more rooms were added, including the chamber where we observed the solstice sunset. During the construction process, the Anasazi incorporated two special ports, or sighting holes, into the walls, one aligned to the summer solstice sunset on June 21, the other to the winter solstice sunset on December 21. In addition, they designed the outside doorway of the castle so that its jambs align to sunset on the two equinoxes (roughly March 21 and September 21), when day equals night in length. These facts led us to believe that the ancestors of the Pueblo people 700 years ago may have employed a precise calendar for planting, harvesting and ritual observances. (R8)

The "observatory" functions of Hovenweep Castle are simple, but they were

extremely important to a culture dependent upon agriculture in an arid land. Planting times had to be known precisely. (R15)

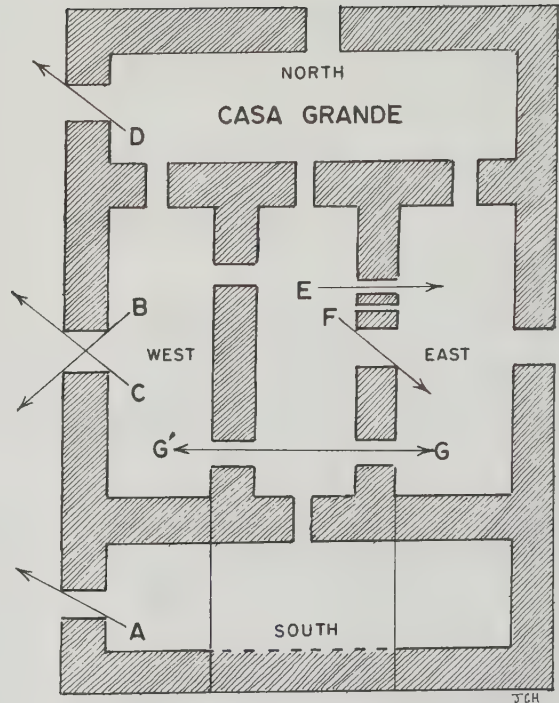
Few archeologists now doubt that the Hovenweep "D" tower was designed for astronomical observations. The case for Anasazi astronomy can also be made 10 kilometers southwest of Hovenweep at Cajon Mesa. Two of the Anasazi buildings there were built with ports that allow sunlight to stream into rooms thereby allowing the occupants to follow the yearly progress of the sun by watching the movement of a spot of sunlight on a wall. Even today, some Hopi and Zuni houses have holes in their walls for the same purpose. (R14)

Arizona. A higher level of astronomical sophistication has been found at the Big House, Casa Grande National Monument, near Coolidge, Arizona. Big House, a large squarish structure, was erected by the Hohokam, the people who dug that amazing network of irrigation canals in the Phoenix area. (See MSC5 in Ancient Infrastructure.) The plan and astronomical features of Big House were outlined by R.D. Hicks, III, in a 1976 issue of Sky and Telescope.

The Big House, dating from A.D. 900-1100, is a three-story rectangular building of caliche and adobe, set upon a one-story platform substructure. The symmetrical plan contains five contiguous room tiers, four of which rise two stories and surround a three-story tier. Astronomically significant alignments are found for windows and holes in the second-story west wall and for the third-story walls.

The alignment holes, all of which give lines of sight to the horizon, were carefully placed, being punched from both sides of the wall and then plastered. Observing was by the ancient alternate doorjambs method. For example, moonset at the minimum northerly lunar declination was viewed through the Rectangular Window ["A" in the figure] by sighting from the left inside jamb to the right outside jamb. Sightings were not reckoned from an imaginary center point of the lunar disk, but rather were referred to the first sighting of the limb. (R6)

Possible astronomical alignments at Casa Grande (Big House), Arizona. Alignments A, B, and C are for moonset at minimum northerly, minimum southerly, and maximum northerly declinations, respectively. D is for sunset at the summer solstice. Third-story openings E, F, and G may be associated with risings of the sun and moon. G' indicates sunset at an equinox. (R6)



The lunar alignments suggest that the Hohokam may have been familiar with those subtle characteristics of the moon's motion that are important in eclipse prediction. This would represent a higher level of astronomical understanding than is evident at the Anasazi's Hovenweep Castle, which was actually built a couple centuries later. Of course, knowledge of the moon's complex motion is irrelevant to fixing planting times.

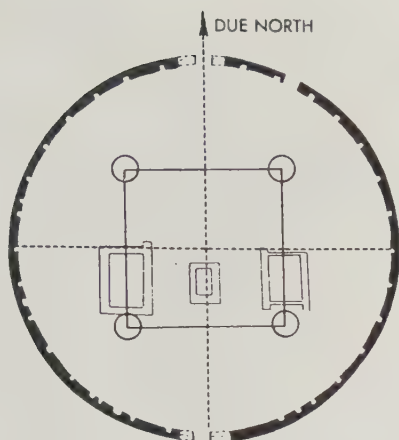
New Mexico. Chaco Canyon, in northwestern New Mexico is noted for its great buildings and the puzzling system of long roads that seems to converge upon this complex---at least they seem to be "roads"! (MSR2 in Ancient Infrastructure) Perhaps more significant to the anomalist is one of the six very large kivas in the complex. This special kiva, named "Casa Rinconada" ("corner house" in Spanish), may be even more astronomically sophisticated than the Big House at Casa Grande, Arizona. Casa Rinconada, you see, seems to echo subtly the plan of Stonehenge, thousands of miles and just as many years distant.

Casa Rinconada stands out among the large Chaco Canyon kivas in several

ways. First, it is isolated from the main complex, being a $\frac{1}{2}$ -mile from Pueblo Bonito. Second, its stonework is of superlative quality. Its builders paid careful attention to its symmetry and its orientation. For example, its north-south axis is aligned to within than $\frac{1}{2}^\circ$ of true north. Third, the kiva's inner wall is marked by two curious groups of niches or compartments.

E.C. Krupp provided further details on these and other relevant features in his Echoes of the Ancient Skies.

At floor level, Casa Rinconada has a diameter of $63\frac{1}{2}$ feet. Its anterooms, peripheral chambers, bathtub-like floor vaults, and stairway entrances are great-kiva features not usually found in the smaller variety. Like the clan-kivas, great-kivas have wall niches, and strings of beads and turquoise pendants---possibly for ceremonial use---were found in the ten wall niches of a great-kiva at Chetro Ketl. Around the walls of Casa Rinconada there are 28 regularly spaced compartments, and these are accompanied by six larger niches that are spaced irregularly, two on the east



Plan view of Casa Rinconada, a 62.5-foot-diameter kiva at Chaco Canyon, New Mexico. Note the 28 evenly spaced niches around the inner wall. (R11)

side and four on the west. (R10)

The significance of the two groups of niches is controversial. It is, perhaps, too easy to ascribe deep astronomical meaning to them. They may, after all, have been just for ritual purposes. As a rule, kivas should be likened to churches rather than observatories. It was in their kivas that the Anasazi contacted the spirit world.

This said, Casa Rinconada does seem to display some astronomical features. Unlike most kivas, it was built partially above ground, and sunlight can enter its interior through portals. In their study of Casa Rinconada, R.W. Williamson and his associates noted that, at the summer solstice, a sunbeam from a narrow window on the kiva's northeast side fell directly upon one of the six irregular niches. However, this may have been only fortuitous. No phenomenon of this



Casa Rinconada. On the morning of the summer solstice, the sun shines through the window at the far right and falls on the seventh niche to the left of the T-shaped entrance to the north. (Robin Rector Krupp)

type has been associated with the other five irregular niches. Even if intended, the marking of this solstice event is no more sophisticated in the astronomical sense than those noted at Casa Grande.

Actually, it is the array of 28 compartments precisely positioned around the kiva's inner wall that awakens an anomalist's interest. Twenty-eight is one of archaeoastronomy's "magic numbers," being the number of spokes in the Big Horn medicine wheel, in Wyoming, and also exactly half the number of Aubrey holes ringing Stonehenge's prominent standing stones.

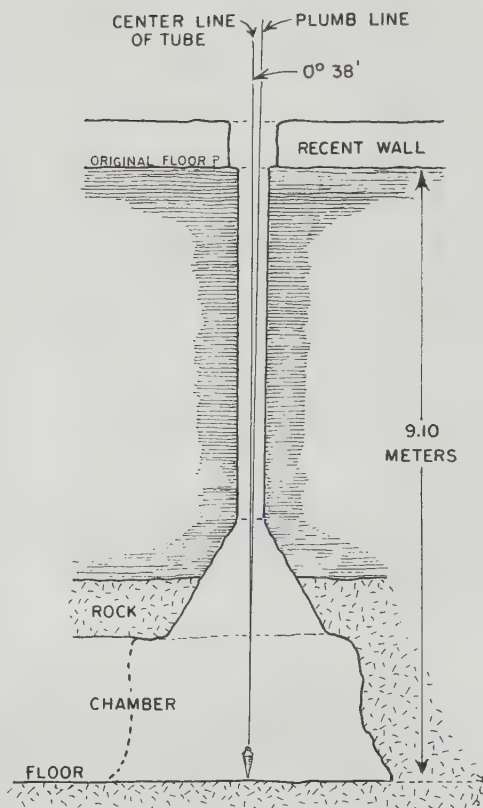
A.F. Aveni has ventured that Casa Rinconada's 28 compartments might represent a counting device related to the lunar month. (R12) Of course, this is just what some claim Stonehenge's Aubrey holes were used for.

In 1974, a Denver newspaper published a sensational article that called Casa Rinconada a "computer," alluding, of course, to G. Hawkins' claim that Stonehenge was a "Neolithic computer" used for predicting solar eclipses. But, just as the idea that Stonehenge was a lithic computer has faded, so has the belief that Casa Rinconada was an observatory involved in counting off the lunar cycle. For one thing, the kiva was covered by a roof, which would certainly have made observations difficult.

The Denver newspaper was certainly stretching the Stonehenge comparison too far. In 1982, archaeoastronomer R.A. Williamson concluded as follows.

The totality of the evidence indicates that Casa Rinconada, built and used during the flowering of the Chaco Canyon culture [the 1100s], was meant to serve as an earthly image of the celestial realm, that it was not an observatory, but a ritual building whose structure reflects the central place astronomy had in ancient Pueblo religious practice. (as quoted in R17)

Mexico. Elementary types of astronomical observatories called "zenith tubes" are located at the Mayan sites of Monte Alban, Xochicalco, and probably other Mexican locations. Zenith tubes are narrow, precisely vertical shafts, as indicated in the sketch. From subterranean chambers at the bottoms of the zenith tubes, Mayan priest-astronomers could observe zenith passages of the sun and important stars. (R9, R10, R11) In



A representative Mesoamerican zenith tube. (R9)

the case of zenith passages of the sun, a zenith tube can duplicate the function of a gnomon, which casts no shadow at noon on the day of a zenith passage. (MS08 in *Ancient Infrastructure*)

Whereas zenith tubes hardly fit our modern concept of an astronomical observatory, the Caracol or Venus Tower at Chichen Itza surely does. First of all, its top two stories are round—an uncommon geometry in Mayan architecture. Second, its rounded top makes the Caracol look a bit like the Mount Palomar observatory with its hemispherical dome. (Actually, "caracol" means "snail" or "snail shell" in Spanish. The reference being to the shell-like appearance of the top of the building.) This resemblance, though, is misleading, because the Caracol's upper structure has partially fallen away giving it that rounded appearance. Actually, if reconstructed, the

Caracol would consist of two round towers, one on top of the other, resting on a squarish base. This corrected picture has been likened to a two-layer wedding cake sitting on a box! In turn, the box and cake are supported by a very wide platform. The usual modern photographs of the Caracol that show mainly the "dome" do not convey the complexity of the supporting structures. And there is more than complexity involved.

Although in a dilapidated state, the Caracol is easily determined to be a strangely imperfect edifice. It is askew in curious ways. E. Hadingham described its "imperfections" as follows.

Today the ruins exhibit several peculiarities---notably, a lack of symmetry about the arrangement of nearly all the main walls, doors, and stairways. The upper platform on which the Caracol stands is of irregular polygon shape, and is not set parallel to the frontage of the main lower platform beneath. But a little ledge near the top of the upper stairway (supporting two small columns) does seem to be

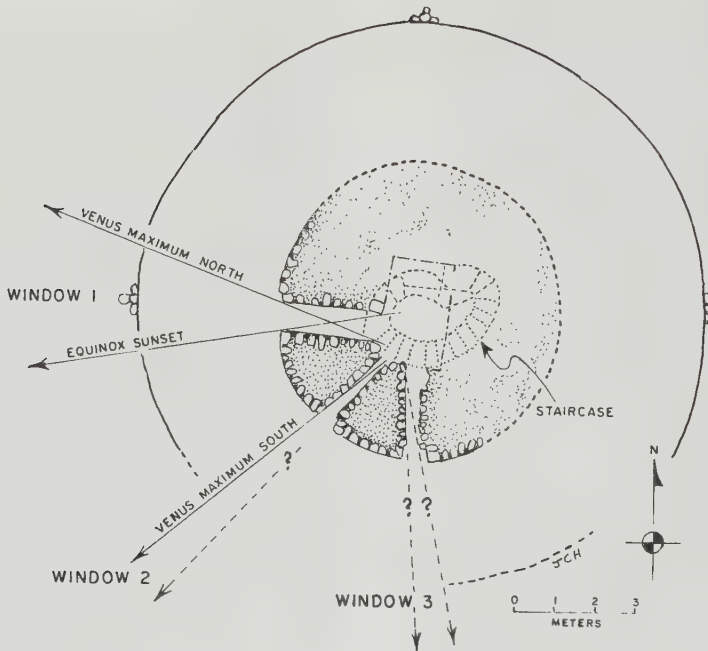
parallel to the lower frontage. Even stranger, the front door does not face the front. Once inside the Caracol, the visitor encounters a second circular wall with four inner doorways positioned asymmetrically in relation to the outer ones. (R11)

The asymmetries and slightly skewed geometries of the Caracol cannot help but raise the suspicions of an archaeo-astronomer. Was the Caracol's architecture deliberately distorted by Mayan astronomers so that they could better observe significant celestial events, such as solstice sunsets, the settings of certain stars, and, above all for them, the positions of Venus as seen in the early morning and evening skies?

In 1973 and 1974, A.F. Aveni and his colleagues determined the alignments of various aspects the Caracol's complex structure. In a 1975 report in *Science* (R4), they presented a table listing 8 platform alignments, 9 doorway alignments, and 12 window alignments! Did the Maya intentionally incorporate this many alignments in the Caracol? Probably not. A few vectors in the *Science* table



The Caracol at Chichen Itza. A probable Mayan astronomical observatory. (Robert D. Hicks, III)



Possible alignments at the Caracol, Chichen Itza, Mexico. (R11)

have no interesting celestial correlations. Most, though, seem to; but some of these "hits" could be fortuitous. As with most stone circles and so-called calendar sites, the Caracol gives the archaeoastronomer a great many possible alignments to match with an even larger number of celestial targets. Some unintentional "hits" are bound to be identified by latter-day archaeoastronomers. Nevertheless, it is just as obvious that a few of the Caracol alignments were very significant to the Maya, particularly those involving Venus.

To illustrate, we know from surviving codexes that the Maya were entranced by the strange early morning and evening appearances of bright Venus. They had worked out this planet's lengthy cycles with amazing accuracy. Actually, they could well have employed the Caracol in preparing their extensive Venus tables. (R10)

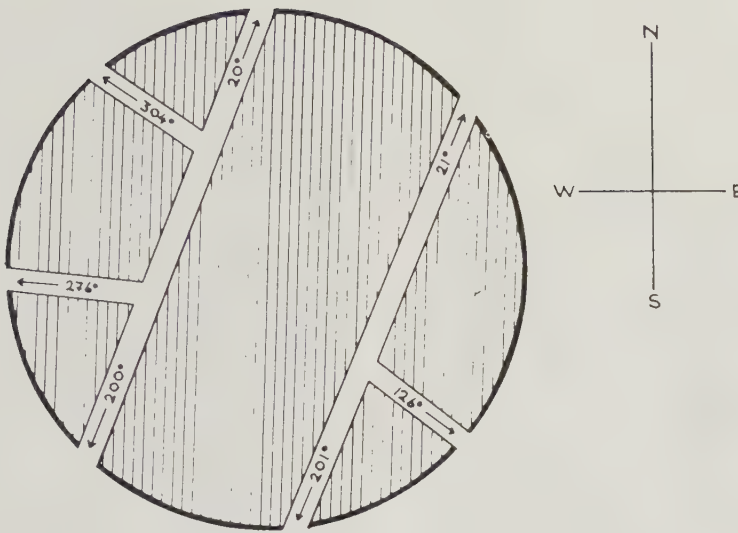
At this point, it is important to mention that archaeoastronomical conclusions may depend upon the investigator's mindset and the expectations of the scientific community of the time. For example, in

1928, O. Ricketson asserted that the Caracol's windows marked only solar and lunar alignments. (R2) Recently, however, alignments with Venus seem more significant. (See the figure above.) The Caracol has not changed, but the anthropologists' thoughts about Mayan cosmology have!

The Caracol is not the only Mexican observatory-type building. Two others on the Yucatan Peninsula are located near Merida and on the east coast just opposite Cozumel. (R11) Although they are many miles apart, these three structures are roughly at the same latitude. This may just be a coincidence, but who knows?

A.F. Aveni has described still another cylindrical tower that bears a resemblance to the Caracol. It is located at Puerto Rico, Campeche, also on the Yucatan. (R5)

In all of the above discussion, our emphasis has been on the possible astronomical uses of the Caracol and its analogs. But, M.T. Shoemaker has pointed out a rarely mentioned fact concerning the Caracol.



Cross section of a cylindrical tower at Puerto Rico, Campeche, Mexico. The tower is solid except for the openings indicated. These may have been sighting tubes. (R5)

The astronomical aspects of the Caracol have long overshadowed an intriguing fact about the structure. Its foundation is actually kind of a layered cemetery. The Lower Platform has about twelve burials within its embutido (the earthen fill inside the platform). And about 24 burials are in the Upper Platform's embutido. (R13)

Perhaps the Caracol was a dual-purpose structure. It would be interesting to know whom the Maya buried under this important structure that was a key to their accumulated knowledge about the heavens and to their interpretations of the cosmos.

X2. South America

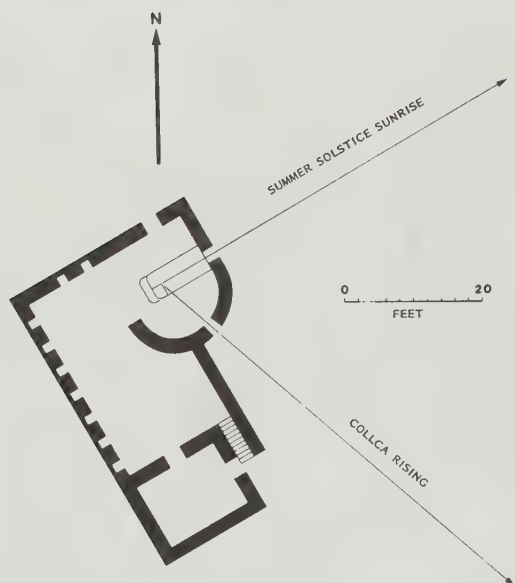
Peru. The Inca were accomplished and ambitious builders, as evidenced by their marvelous road system, their great walls, and imposing fortresses. Apparently, they were not as fascinated by the heavens as the Maya, for we have so far identified only a single observatory-type

building in all of the Incan Empire. This is the Torreón ("tower" in Spanish) at Machu Picchu.

In describing the Torreón, E.C. Krupp calls it an "exquisitely masoned building."

Built upon a natural mass of rock, the Torreón, also known as the Caracol, or "snail," starts out as an ordinary-enough structure with straight walls and a rectangular floor plan. The east wall curves, however, into a semicircle that partitions the room into an outer hall and an inner chamber. It is the curved wall, reminiscent of a snail's convoluted shell, that prompts the local nickname. Bingham noticed the similarity between this semicircular temple and the Coricancha, or "Temple of the Sun," at Cuzco, and thought that the Torreón also might have been a Temple of the Sun. Trapezoidal wall niches---a standard feature of Inca architecture ---and what seemed to be an altar carved from the protruding natural rock confer a formal, ceremonial character upon the Torreón. (R10)

Three windows or apertures were



Plan of the Torreón at Machu Picchu, Peru. This structure's apertures may have astronomical alignments but, if so, they are "underwhelming." (R10)

built into the walls of the Torreón's inner chamber. Through the northeast windows, occupants of the chamber could observe the June solstice sunrise or the rising of the Pleiades. The southeastern window was equipped for some unplumbed reason with stone pegs. Its astronomical target is not as obvious as at the northeastern window. The only astronomical alignment of any importance seen from the southeastern window is the June rising of Collca, a constellation of the Southern Hemisphere. As Krupp admits, this window's astronomical significance is underwhelming. The third window opening to the northwest is even more problematical---there are no astronomical targets that modern archaeoastronomers deem interesting. Of course, the Inca may have had other criteria!

In sum, the Torreón does not display the multiplicity of significant astronomical alignments that we think an observatory should have. It may have been built primarily for ceremonial use.

Bolivia. Also high in the Andes, near the shores of Lake Titicaca, the complex of Tiahuanaco incorporates a structure

called the Kalasasaya that some archaeologists believe may have been used as an observatory---at least some of the time. In fact, the Kalasasaya is generally considered to have been a temple rather than an observatory; but often it pays off to look beyond this all-too-common label used by the archaeologists and anthropologists.

The Kalasasaya looks not at all like the Caracols of Mexico and Peru; those snail-shaped observatories of the Maya and Inca to the north. It is instead a rectangular enclosure about 400 feet by 450 feet. The periphery of the rectangle is defined by a wall along which stand many pillars. Some of these pillars have fallen or gone missing but there may have been one for every day in the solar year. This fact, if true, would not make the Kalasasaya an observatory. The many pillars, though, do provide many opportunities for astronomical alignments. If the Kalasasaya pillars were actually for astronomical alignments, the Kalasasaya would have been analogous in its operation to the stone rectangles of Europe's megalithic era. (MSH20 in Ancient Infrastructure) However, unlike the Europe's megalithic rectangles and circles, the Kalasasaya is a unified building, not a pattern of dispersed monoliths. So, if we can discover some significant astronomical alignments, we can include the Kalasasaya among our ancient observatory buildings.

It is here that most professional archaeoastronomers abandon the Kalasasaya discussion because it enters into the fantastic. The following controversial astronomical interpretation of the Kalasasaya is the brainchild of A. Posnansky, who studied the whole Tiahuanaco complex in the early 1900s. He arrived at many conclusions located far from today's mainstream, as we shall now see.

Posnansky's attention was directed toward eleven pillars along the western wall of the Kalasasaya. His determinations of their alignments along with other aspects of the Kalasasaya convinced him that this structure was able to register not only solstices but equinoxes as well. This finding would not have upset the scientific community in itself, for many ancient calendar sites and stone circles seem to have this capability. But Posnansky went two giant leaps further. He claimed that his observations of the solstices employing the Kalasasaya pillars indicated that, at the time the structure

was built, the obliquity of the ecliptic was $23^{\circ}08'48''$ instead of today's $23^{\circ}30'$. Extrapolating backward in time, this difference of $21'12''$ implied that the Kalasasaya dates from 15,000 B.C.! Of course, both Posnansky's measurements and age determination are rejected today. It is, after all, very difficult to measure the obliquity of the ecliptic with such high accuracy by sighting on the broad sun using megalithic structures that may have shifted a bit over the millennia.

Only in fringe archeology do we hear Posnansky's dates bandied about these days. In the fringe literature, Tiahuanaco is often called "the oldest city in the world." It was built, as this theme goes, "before the Flood." (R16)

In short, it seems unlikely that the Kalasasaya was the sophisticated astronomical observatory that Posnansky claimed. This does not mean that some astronomical data are implicit in its structure---such as the total number of pillars.

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- R2. Ricketson, Oliver, Jr.; "Astronomical Observations in the Maya Area," Geographical Review, 18:215, 1928. (X1)
- R3. Berlitz, Charles; Mysteries from Forgotten Worlds, Garden City, 1972, photos. (X2)
- R4. Aveni, Anthony F., et al; "The Caracol Tower at Chichen Itza: An Ancient Astronomical Observatory?" Science, 188:977, 1975. (X1)
- R5. Aveni, Anthony F., ed.; Archaeoastronomy, Austin, 1975, pp. 178, 182. (X1)
- R6. Hicks, Robert D., III; "Astronomy in the Ancient Americas," Sky and Telescope, 51:372, 1976. (X1)
- R7. Krupp, E.C.; In Search of Ancient Astronomies, New York, 1978, p. 190. (X1)
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- R15. Malville, J. McKim, and Putnam, Claudia; Prehistoric Astronomy of the Southwest, Boulder, 1989, pp. 7, 37, 38. (X1)
- R16. Sitchin, Zecharia; The Lost Realms, Santa Fe, 1990, p. 223. (X2)
- R17. Gabriel, Kathryn; Roads to Center Place, Boulder, 1991, p. 83. (X1)

MSA2 The Great Pyramid as an Astronomical Observatory

Description. The use of the Great Pyramid's Descending and Ascending Passages to obtain astronomical references during Pyramid construction and, later, the addition of the Grand Gallery to these two Passages for the purpose of observing star transits across the meridian until the time the Pyramid was completed.

Data Evaluation. The linear and angular dimensions of the Great Pyramid are well known---and much has been made of them over the years. These data are consistent with the claim made in 1873 by R.A. Proctor that the Great Pyramid could have been a temporary astronomical observatory of remarkable potential. Although this is only one person's surmise, Proctor's hypothesis does neatly account for some of the curious characteristics of the Descending and Ascending Passages and the Grand Gallery as well. We are not aware of any historical data confirming that the Great Pyramid was actually used in the manner suggested by Proctor. Rating: 3.

Anomaly Evaluation. If the Great Pyramid was used in the rather far-fetched scenario hypothesized by R.A. Proctor, the ancient Egyptian engineers and astronomers were an ingenious lot and well aware of elementary optics and the long-term procession of the stars. According to R.A. Proctor, the Great Pyramid as a scientific instrument was not surpassed until the invention of the telescope in the Seventeenth Century. Rating: 2.

Possible Explanation. Proctor's hypothesis is reasonable, although given short shrift in mainstream archeology. No explanation required.

Similar and Related Phenomena. The Great Pyramid as a terrestrial model of the cosmos (MSP8); curious mathematical relationships among the dimensions of the Great Pyramid (MSP8); precise orientation of the Great Pyramid (MSP6).

Entries

X1. General observations. To the best of our knowledge, the telescope was not known to the ancient Egyptians. To them the stars were merely points of light that wheeled across the night sky. The task of the Egyptian astronomers was to trace the paths taken by these stars and incorporate them into a model of the cosmos. To accomplish this with high accuracy, they invented various sighting instruments, such as armillary disks, and associated observational techniques. But did these astronomers of 5,000 years ago also think to construct a building dedicated to astronomy; that is, an observatory?

Few thought so until 1883, when R.A. Proctor published his book The Great Pyramid: Observatory, Tomb, and Temple. Today, many question whether the Great Pyramid was ever a tomb, and we cannot conceive that it was a temple crowded with worshippers. As for the

Great Pyramid being an observatory, Proctor made a good case for it being just that during its construction. In its finished form, with all four sides covered with smooth facing stones and topped by a pyramidion, there was obviously no place for an astronomer to stand and point his instruments. Yet, during its construction phase, the Great Pyramid may very well have been a temporary but very remarkable observatory.

It is unlikely that a non-astronomer would ever have conceived the scenario that Proctor put forward in his book. He hypothesized that, first, before one stone block was hauled in from the quarry, the Egyptian astronomers determined the meridian of the Giza Plateau. They did this by watching the stars circle the north celestial pole and thereby established a true north-south line. Proctor suspected that they chose alpha Draconis as their North Star. In 2,160

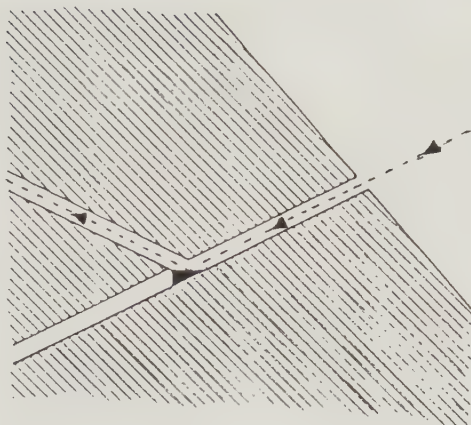
B.C., it would have been $3^{\circ}43'$ from the pole.

In the next step, Proctor had the Egyptian workers begin tunneling at an angle into the live rock on the Giza Plateau, keeping the shaft pointed precisely at alpha Draconis. This tunnel ultimately became part of the Great Pyramid's Descending Passage. At Giza's latitude of 30° , the angle of the Descending Passage would have had to be $26^{\circ}17'$ to be aligned with alpha Draconis. When measured today, the Descending Passage, some 350 feet long, is precisely that and amazingly straight. The underground termination of the Descending Passage turns out to be on the vertical axis of the Pyramid; that is, it is precisely beneath the point of the Great Pyramid. In this manner, said Proctor, the Egyptians oriented the Pyramid and established its axis. Although not yet an observatory, the Great Pyramid's first structural element was essentially a simple astronomical instrument.

Proctor's hypothetical scenario continued as follows. Next, the first ten courses of Pyramid blocks were somehow maneuvered into place. The Descending Passage, though, was not abandoned. Rather, it was continued upward through the newly laid stones toward alpha Draconis. Beyond the tenth tier, however, the Pyramid builders could not extend the Descending Passage any farther than the Pyramid face. Rather than lose their valuable reference line, the builders adopted a remarkable stratagem. They began constructing what is now called the Ascending Passage, again at an angle of $26^{\circ}17'$, but this time upward and into the heart of the growing Pyramid.

How could alpha Draconis be seen from the Ascending Passage? Simple, Proctor assures us. The Egyptians sealed off the Descending Passage at its juncture with the new Ascending Passage, and there created a reflecting pool---a mirror. Supporting this wild surmise, it can be seen today that the masonry around the supposed pool is more finely jointed, smoother, and harder than elsewhere in the Passages.

Using the image of alpha Draconis in the reflecting pool, the tunnelers were able to accurately align the Ascending Passage. The precise angling of the two Passages and the ingenious idea of a reflecting pool at the vertex do seem "far-out" for a culture existing 4,500 years



R.A. Proctor speculated that the builders of the Great Pyramid temporarily sealed off the Descending Passage and created a water pool at its juncture with the Ascending Passage. This could, in principle, have been used to help align the Ascending Passage. (R1)

ago, but they really support Proctor's hypothesis. It would be difficult to conceive of any other reason for the facts just recounted.

Proctor wrote:

By using the known properties of liquids combined with the known property of light rays, the ancient builders were able to orient and level a building to a very great height. (as quoted in R1)

So far, the astronomical alignments of the Great Pyramid were used only to guide construction. Proctor, again thinking boldly, next turned the combined Ascending and Descending Passages into components of a scientifically useful observatory. This was suggested because the Ascending Passage suddenly expands vertically into the so-called Grand Gallery, which measures 28 feet high. In addition to its unusual height, the Grand Gallery is equipped with an extraordinary series of slots and removable roof stones. These features and the Gallery height were in no way required for guiding the pyramid workmen. Again, it is hard to imagine what purpose these enigmatic features might have served except astronomy. The only remotely attractive suggestion we have come

across proposes that the slots were used for storage of the portcullis stones. (MSP7-X6)

Proctor, thinking like an astronomer, saw the Grand Gallery as a great asset to pre-telescope astronomers. It was high, narrow, and aligned precisely with the north celestial pole.

Looking up through such a slot, an observer could watch the passage of the entire panoply of the zodiac, easily noting the transit of each star across a perfect meridian---precisely what is done today by the modern astronomer when he sets his transit circle to the vertical meridians. As Proctor points out, such a Grand Gallery might well be described as the only very accurate method available for preparing an accurate map of the sky and of the zodiacal cyclo-rama---before the invention of the

telescope in the seventeenth century of our era. (R1)

The above is a necessarily brief sketch of Proctor's scenario. In his view, the Great Pyramid could well have been an astronomical observatory, incomparable for its time, but only until its Passages were finally sealed for what the Egyptians hoped would be forever. Whatever the main purpose of the Great Pyramid was (or still is!), astronomy was apparently part of the master plan.

Reference

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MSB MISCELLANEOUS ANCIENT STRUCTURES

Key to Phenomena

MSB0	Introduction
MSB1	Miscellaneous Ancient Structures: North America
MSB2	Miscellaneous Ancient Structures: Mesoamerica
MSB3	Miscellaneous Ancient Structures: South America
MSB4	Puzzles of Inca Stone Masonry
MSB5	Tiahuanaco: The Baalbek of the New World
MSB6	Possible Neanderthal Structures
MSB7	Puzzles of the Maltese Temples
MSB8	Baalbek: The Tiahuanaco of the Old World
MSB9	Miscellaneous Ancient Structures: Asia
MSB10	Miscellaneous Ancient Structures: Oceania
MSB11	Miscellaneous Ancient Structures: Africa

MSB0 Introduction

After the forts, pyramids, towers, and other well-defined structures are filtered out and cataloged, as they are in this volume and its companion, Ancient Infrastructure, we are left with a wonderful hodgepodge of diverse miscellany. Some of these "left-over" structures are simple, straightforward platforms, pavements, and foundations, but many others are of complicated design. The purposes of some of them are totally incomprehensible to us today, although they surely had meaning for their builders.

Collectively, these miscellaneous structures raise a long list of questions for the archeologist and anthropologist---some important, some trivial. A short list of some of the more interesting questions follows.

- Do the many examples of large, interlocking, precision-fit stone structures prove early cultural diffusion in the Pacific?
- Did the Vikings venture farther south than Newfoundland?
- Are there hidden messages in any of the Mesoamerican buildings?

- Did the Neanderthals actually build structures?
- What was the purpose of the very tiny buildings found in Mesoamerica?
- Did the ancients know of a stone-softening agent?
- How were stone blocks weighing over 100 tons moved and manipulated?
- What were the purposes of the Osireion in Egypt, the oddly carved stone blocks at Tiahuanaco, and some of the totally enigmatic buildings built by the Inca? To name just a few!

MSB1

Miscellaneous Ancient Structures: North America

Description. Ancient North American buildings, especially those in Chaco Canyon; stone pavements and terraces; above-ground stone chambers; mysterious foundation remnants; unusual burial vaults; fire-hardened mud structures.

Data Evaluation. The quality of the data collected so far varies from high-quality, professional studies to century-old news items in science magazines. Several discoveries that appear quite remarkable do not seem to have been followed up in the archeological literature and may be great exaggerations. Our data ratings are the first figures in the ratings below.

Anomaly Evaluations. The following anomalies and curiosities are noted in this section. The anomaly ratings are the second figures in the ratings.

- Structural evidence for Viking visits to New England shores (X1).
Ratings: 3/1.
- Unique structure construction methods (X3). Ratings: 1/3.
- Unexpectedly sophisticated structures (X4, X6, X11). Ratings: 3/2.
- Structures of great age (oldest in North America!) (X5, X7). Ratings: 3/3.
- Evidence of intense heat (a possible connection to the Scottish "fused forts" described in MSF3) (X7). Ratings: 2/1.
- Structures requiring prodigious labor and strong social organization incompatible with recognized historical scenarios (X11). Ratings: 1/3.
- Use of the true arch in the New World (X10). Ratings: 2/2.

- Enigmatic structures in terms of purpose and builders (X2, X8, X9, X10, X11).
Ratings: 1/2.

Similar and Related Phenomena. The Newport Tower (MST1); the Mystery Hill Complex (MSS3); underground stone chambers (MSU1); stone forts (MSF2); Fort Ancient (MSF1); fused forts (MSF3); use of the true arch (with keystone) in the New World (MSB2); New World astronomical observatories (MSA1).

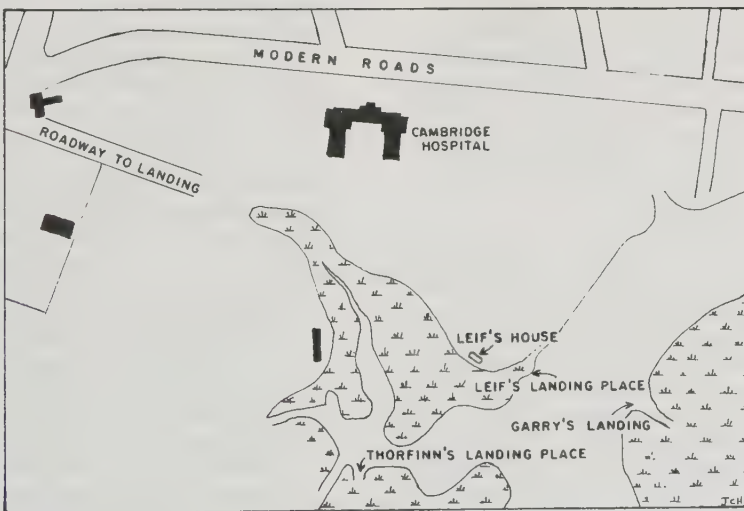
Entries

X1. Massachusetts. Except for the controversial tower at Newport, Rhode Island, New England boasts few ancient structures that merit the term "building." Instead, this six-state region is home to many curious stone chambers (MSU1) and, of course, the varied lithic structures in the famous Mystery Hill complex in New Hampshire (MSS3). This general survey of anomalous structures found in Massachusetts is left mainly with what we call "pavements" and "terraces." These structures may originally have supported wooden structures of some sort. It is hard to say. But most are enigmatic in some way and, therefore, worthy of our attention.

Early archeologists remarked on several sorts of New England stone structures that did not seem to be the

work of Indians---the Newport tower being the most obvious. A century ago it was perfectly permissible to declare that these stone structures were evidence that the Vikings had reached as far south as Massachusetts. Today's archeologists deny such Precolumbian visits. But we see this early "Viking" mindset in our first example.

In Massachusetts (also Maine) there are several "pavements" of stones that lead down to navigable waters. These paved strips resemble crude roads, and they led C. Horsford, in 1899, to compare them to the sjavar-gatas that the Norse built in Iceland. (R3) Today, these particular pavements are written off as early colonial constructions, probably with good reason because non-Viking bricks are present in some of these pavements.



1899 map of the supposed Norse ruins in what is now Cambridge, Massachusetts. (R3)

In 1940, A.H. Hofmann uncovered a very different kind of pavement in Andover, Massachusetts. This layer of angular stones was undisturbed and considered prehistoric. Laid upon a foundation of white sand, the pavement was kidney-shaped and about 8 feet square; depth about 10 inches. A rim of larger stones surrounded the pavement proper. Indian artifacts are abundant in the surrounding area but are completely absent in the pavement area and a buffer zone 4-feet wide. The structure is probably of Indian origin, but its purpose is not at all obvious. Perhaps it was the foundation of a sweathouse. (R6)

A third type of Massachusetts structure of interest here comprises terraces of unknown purpose. F. Fowke described two of these in a 1900 article in the American Anthropologist in which he, like Horsford above, was interested in possible Norse remains in New England.

Near East Watertown [Massachusetts] there is a peculiar work locally known as the "Amphitheater." The depression which determines its site is a natural formation, known to geologists, from its shape, as a "kettle-hole"; that is, a hollow formed by the melting of a mass which became detached from the main body of the glacier when it covered this spot, and was imbedded in the gravel deposit by the ice-sheet. Around two-thirds of the circumference of this, artificial terraces have been constructed, apparently to furnish seats from which spectators might view the exercises or ceremonies which presumably took place on the inclosed level area at the bottom.

.....

Somewhat more than a mile south of the amphitheater there occurs a work which seems to have been intended for the same purpose, and consequently must owe its construction to the same people. At one side of a small area of smooth bottomland, a sloping bank rises rather steeply to a height of perhaps 30 feet. Along this slope are three or four terraces, one above another, not large enough to be used for tillage. There is no knowledge or record concerning the time or the object of their construc-

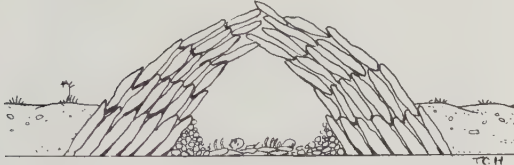
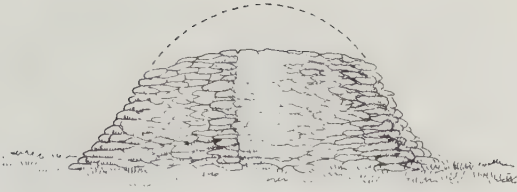
tion. (R4)

Fowke was adamant that the Indians never built structures of this type and was therefore open to the Viking theory, as is evident in the title of his paper in the American Anthropologist (R4).

X2. New Hampshire. In Acworth, in the southwestern corner of this state are found several crude structures composed of heavy, flat slabs of granite. Their roundish, domed shapes well merit the local name: "Bee Hives." The Bee Hives were built entirely above-ground in contrast to the subterranean stone chambers so common in New England. (MSU1) The Bee Hives possess small entrances and are not large enough for a man to stand erect inside. Our reference gives no dimensions, dates, or other data useful to the archeologist. Speculations as to purpose, however, are many. Were the Bee Hives storm shelters for humans, or perhaps sheep? Were they animal traps or prehistoric shrines? No one knows. (R9)

X3. North Carolina. Curious burial vaults occupy a vantage point overlooking North Carolina's Kanawha River. While these ancient structures are rather crude, their unusual mode of construction merits mention here. No dating is provided by the century-old report.

They are placed upon the solid rock formation, the earth having been removed, and a level space left, from ten to thirty feet in diameter. Centrally in this was placed a layer of flat stones, with the best edge inward, around a circle about three feet in diameter. Upon the outer edge of these, others were placed with their outer edge resting upon the prepared foundation, running entirely around the circles, the stones of one layer breaking joints with those below. [See sketch.] Outside of the inner row, with the edges resting on it, other circles were added, until a diameter ranging from twenty to fifty feet, and even



An unusual Indian stone burial vault in North Carolina. (R5)

more, was attained. The height of these piles was found to vary from four to eight feet, sometimes ten feet; but in all cases the circular space, or opening in the centre, continued to the top. (R5)

X4. Florida. The Gulf Coast of Florida is noted for its shell mounds and keys. (MSR1 and MSR2 in Ancient Infrastructure) On the opposite coast, near St. John's River, there is an even more remarkable ancient mound. It is located on Murphy's Island and was opened (rather unscientifically) over a century ago, revealing a truly amazing interior. The discovery was announced in a very early issue of the Scientific American Supplement.

After making a breach of thirty-five feet, they discovered a hard wall made of coquina or shell rock. This wall was cemented, and was ornamented with various figures of warriors with bows and arrows and various reptiles. After much difficulty a breach was made in the wall, and, by the light of the torch, several of the party entered; much surprised, they found themselves within a vault eight feet high with room twelve by fifteen feet long,

with armed warriors encased in niches, all in a state of petrification. This is certainly a most wonderful discovery, and has produced a profound sensation. (R2)

Despite the "profound" nature of this structure, we have seen nothing further in the science literature.

X5. Ohio. Ohio is home to some of the Moundbuilder's greatest works, such as the earthen walls at Fort Ancient (MSF1) and numerous stone forts (MSF2). And, according to the March 17, 1992, issue of the New York Times, the oldest structure in North America is also located in Ohio, near Medina, 5 miles west of Akron. The Paleo Crossing Site, as it is called, consists of three post holes and two pits in an area of about 150 square feet. Evidently, a wooden structure of some sort existed here about 10,200 B.C., according to radiocarbon dating. Distinctive Clovis points, typical of this time period, were also found in the area. (R15)

X6. Mississippi. The Massachusetts "pavements" mentioned in X1 are on the crude side compared to the sophisticated structure described in an 1876 issue of the Louisville Journal. In fact, the structure is so remarkable that, along with the nature of the source, one is tempted to doubt the story.

In the South-western part of Franklin county, Miss., there is a platform or floor of hewn stone, neatly polished, some three feet underground. It is about one hundred and eight feet long. It extends due north and south, and its surface is perfectly level. The masonry is said to be equal, if not superior, to any work of modern times. The land above it is cultivated, about thirty years ago it was covered with oak and pine trees, measuring from two to three feet in diameter. It is evidently of remote antiquity, as the Indians who reside in the neighborhood had no knowledge of its existence previous to its recent dis-

covery. Nor is there any tradition among them from which we may form any idea of the object of the work, or of the people who were its builders. There are also a canal and well connected with it, but they have never been explored. A subterranean passage may be underneath. Further explorations may throw some light upon its origin. (R1)

No further explorations were reported in the literature examined so far.

X7. Colorado. In 1982, some remarkable fire-hardened mud structures in the Rockies were declared to be the remains of the oldest buildings in North America. (The Ohio wooden structures mentioned in X5 had not yet been discovered.)

The remains of 16 hardened-mud structures recently discovered in the mountains northwest of Denver may prove to be the oldest-known buildings in North America. Found during construction of a pipeline, the remains are 4,000 to 7,000 years old, compared with 4,700 years for the oldest Egyptian pyramid. (R10)

These buildings, which appear to have been dwellings, were constructed from mud! Usually, only a few centuries are needed to disintegrate mud structures, but these had been fire-hardened into durable, pottery-like material. This evidence of destruction by fire appears again and again at ancient sites. This site's antiquity along with its fiery demise raises a red flag for anomalists.

X8. Montana. Three strange, dry-laid masonry structures were discovered in 1956 during the construction of a road along the southern boundary of Glacier National Park. These hemispherical chambers were constructed by the careful placement of tabular sandstone slabs. Arranged neatly in horizontal courses, the slabs converge to form a dome. Some of the slabs seem

to have been trimmed to make better fits. Inside, the floors are paved with sandstone slabs 1-inch thick and 1-foot long, producing a regular, flagged surface.

The mystery here arises from the small dimensions of the chambers. One interior measures only 4 feet or so in diameter, and less than 2 feet in height under the dome. Obviously, the chambers were too small for residential purposes. They may have been used by trappers to cache pelts and provisions, but this application seems incompatible with the great skill and effort expended in their construction. (R8)

A great tree grows over one chamber, suggesting that it is very old---perhaps older than European penetration of this part of the continent.

X9. Northwest Territory. It was tempting to classify the subject structures with the British stone circles (MSH7 in Ancient Infrastructure), but apparently the "standing stones" in question were the foundations of buildings of some sort. Given the remote location of the site and the ponderous nature of the stones, we must devote some space to this desolate site.

About 8 miles above the Maguse Mission at a point of branching of the river just below difficult rapids is a great wall of rocks piled up by ice action. Behind this dam, which seems to be slowly erasing the site, were about 10 circular or slightly angular enclosures, 10 to 15 feet in diameter, of large stones set upon end. They were obviously man-made, apparently the bases of habitations of some kind. Many of the stones that formed parts of these walls were of such a size that they could have been moved only by the concerted effort of a number of people. The stones were covered with lichens, and the sod within the circles looked precisely like that outside, indicating neither fertilizing nor retarding effects for some time. (R7)

X10. Utah. The April/May 1999 issue (no. 27) of the Ancient American opens with a series of thirteen remarkable photographs showing the remains of rock structures in Utah's Wasatch Mountains. Professional archeologists have not yet examined this site, so we can only paint a rough picture of what could be a startling discovery.

First, there are low stone walls, running for as far as 200 feet, with apparent deliberate openings and right-angle turns. The foundations of an ancient building are certainly suggested. Second, the site displays many pavements of stone blocks, rectangular and apparently cut to fit. Finally, stone chambers are located nearby. Some of these are 3 to 4 feet wide and served no obvious purpose. Most surprising, though, was the use of true arches in chamber construction---surprising because it is usually stated that the early inhabitants of the New World never invented the arch. (R18)

Unfortunately, no dates for the site are available, nor are any pottery shards, projectile points, burials, or similar artifacts mentioned. The site looks artificial, and it looks old; but further study is essential.

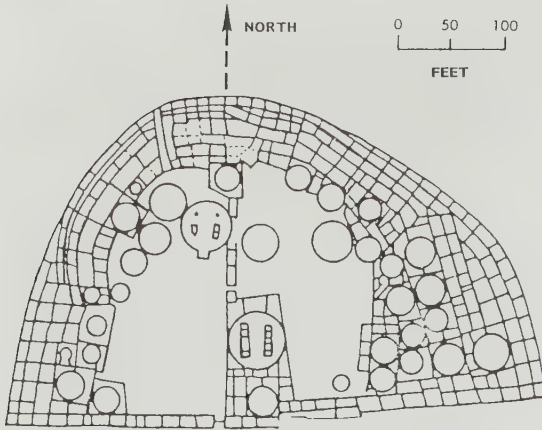
The fact that the owner of the site declares that intruders stole artifacts from one of the chambers, including "metallic tablets covered with an unknown script," raises the caution flag!

X11. New Mexico. Of all the ancient buildings in North America, the largest and most sophisticated are found in an archeologist's paradise named Chaco Canyon. Chaco Canyon is renowned not only for its huge, superbly constructed buildings but also for its rather mysterious system of roads (MSR2 in Ancient Infrastructure), a kiva that served as a rather sophisticated astronomical observatory (Casa Rinconada, MSA1), and, lastly, its status as an elaborate complex that seems to have been built more for rituals and ceremonies than for residence. In this Catalog section, the focus is on the buildings, in which we see three interesting features:

(1) The large size and excellent workmanship of the so-called Great Houses;



One of thirteen unusual rock structures in Utah's Wasatch Mountains. Note the use of the true arch. These structures have not been examined by professionals and may be recent. (R18)



Plan of Pueblo Bonito in Chaco Canyon, New Mexico. It contains some 800 rooms plus a multitude of circular kivas. (Adapted from R14)

(2) The prodigious effort expended by the Anasazi builders in bringing wooden beams from great distances for building construction; and

(3) The curious construction and still-mysterious purpose of the many large circular structures called "kivas."

The Great Houses. The number of Great Houses in Chaco Canyon and its far-flung environs is said to be about 100. Within the canyon itself, sources stipulate as few as 9 and as many as 19! All sources, however, agree that Pueblo Bonito is the most impressive and best-researched. The Anasazi began work on Pueblo Bonito in the Tenth Century. By 1150 it was at least four storeys high and contained 800 rooms, plus 37 circular kivas. Overall, Pueblo Bonito is D-shaped. The straight edge of the D is about 500 feet long and oriented east-west. It is about the size of two football fields and was certainly not a trivial undertaking over a thousand years ago.

The Anasazi were expert masons, and they didn't stint at Pueblo Bonito. S.H. Lekson et al were inspired to write as follows:

Pueblo Bonito and the other Great Houses in the canyon are constructed

from blocks of sandstone, carefully coursed (horizontally aligned) in beautiful patterns...The sandstone blocks fit together tightly, forming walls that are as much as a meter thick at ground level and decrease slightly with each successive story. The walls are far stronger than those at other Anasazi settlements. Some 45,000 kilograms of sandstone cut by hand from the surrounding cliffs, for example, were needed to build a single small room in one of the Great Houses; as many as 50 million pieces of sandstone may have been cut for build Chetro Ketl alone [another Great House]. (R11)

Multiply the 50 million slabs of sandstone by the number of Great Houses and you can appreciate the magnitude of the Chaco Canyon project

The wooden beams. By the 1980s, archeological research at Chaco Canyon had counted about 200,000 large wooden beams used in the construction of the Great Houses. While the millions of sandstone blocks were cut from nearby canyon walls, the spruce and fir logs had to be transported more than 75 kilometers from mountains south and west of Chaco Canyon.

The average wooden beam was 22 centimeters in diameter, 5 meters long, and weighed 275 kilograms (600 pounds). How were these logs transported such great distances? The logs show none of the scars that would have been incurred had they been dragged or rolled. Most likely they were carried---an impressive accomplishment requiring a strong social structure and a powerful psychological impetus. (R12, R13, R17)

The kivas. The kivas of the Anasazi were circular rooms usually built below ground level. The largest of the 37 recognized at Pueblo Bonito is 52 feet in diameter. Each kiva had its fire pit, ventilating shafts, and wooden pillars that supported a roof of some sort.

The salient questions about the kivas, especially the very large kivas, has always been: What purpose did they serve? Exactly what transpired in them? The Pueblo people of today still employ small kivas for ceremonial purposes, but no one knows for certain how the Anasazi used their very large kivas. Almost surely there were ceremonies

there, probably rites with astronomical associations.

It is fascinating to note that the great kiva called Casa Rinconada, located opposite Pueblo Bonito contains 28 niches in its circular walls. This number, like Stonehenge's 56 Aubrey holes, may well be associated with the lunar cycle (MSA1-X1). But the great kiva at Chetro Ketl, another Great House, possesses 29 niches! Why the extra niche?

When the Anasazi abandoned Chaco Canyon---for some still-mysterious reason---they sealed up the kiva niches. When modern archeologists opened them, each contained a string of beads and turquoise pendants. One string of beads was 17 feet long!

In sum, the Chaco Canyon kivas are of curious construction and still echo with the nuances of unknown Anasazi rites. (R14, R16)

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- R10. Anonymous; Science Digest, 90:22, August 1982. (X7)
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- R14. Haddingham, Evan; Early Man and the Cosmos, New York, 1984, p. 149. (X11)
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- R17. Mestel, Rosie; "Where Did Desert Builders Get Their Wood?" New Scientist, p. 10, August 6, 1994. (X11)
- R18. May, Wayne; "Utah's City in the Clouds," Ancient American, no. 27, p. 3, April/May 1999. (X10)

MSB2

Miscellaneous Ancient Structures: Mesoamerica

Description. Ancient Mesoamerican buildings and structures, almost all Mayan, that are curious or anomalous because of their miniaturization, their orientation, claimed hidden messages, or just their peculiar design. One structure, a megalithic wall, suggests to some a pre-Mayan culture.

Data Evaluation. While most of the sources are science journals and books by scientists, a few are from more popular publications. For this reason, we separate our data evaluations and present them as the first figures in the ratings below.

Anomaly Evaluations. The following anomalies and curiosities are identified in this section. The anomaly evaluations are the second figures in the ratings.

- Diminutive buildings interpreted as evidence for the existence of very small people. (X1) Ratings: 1/1.
- The use of the true arch in the New World. (X1) Ratings: 2/2.
- Possible use of a stone-softening agent at Mitla. (X1) Ratings: 3/1.
- Hidden messages in Mayan buildings at Uxmal. (X1) Ratings: 2/2
- Enigmatic building design at Alta Vista. (X1) Ratings: 1/2.
- Precision megalithic construction at Labaantun. (X2) Ratings: 1/1.

Similar and Related Phenomena. Use of the true arch in North America (MSB1-X10) and South America (MSB3-X1); hidden information encoded in the Great Pyramid (MSP8); Stonehenge's rectangle (MSH18 in Ancient Infrastructure); precision-fit megalithic walls (MSW3 in Ancient Infrastructure); traditions of "little people" in many areas of the world (MAA in another volume).

Entries

X1. Mexico. By the Tenth Century, the center of the Mayan civilization had shifted north into Mexico. It is here that we find some of their most puzzling buildings.

Diminutive buildings. To introduce this enigma, we quote first from a Nineteenth Century account of A. Le Plongeon's explorations in Mexico. (Old city spellings are retained.)

Still other cities exist which are fraught with interest in an exceptional degree, for they have been inhabited by a race of dwarfs. The diminutive nature of the inhabitants is shown by the buildings, the doorways of which are thirty-six inches high by eighteen inches in width. One of the largest temples in these dwarf cities is twelve feet long by

nine feet wide, everything else about them being in the same ratio of dimensions. The names of some of these cities are Meka, Nichte, and Cankun. These are situated on the east coast of Yucatan, opposite the islands of Mugerres and Cozumel. (R1)

One of the Mayan sites alluded to above is now named Tulum. Tulum is very unusual among Mayan sites because the streets are laid out in a rectangular grid, like most modern cities, but distinctly un-Mayan. The second interesting aspect of Tulum is its miniaturization, which was aptly described by C.B. Hunter in his 1986 book A Guide to Ancient Maya Ruins.

The buildings, especially the doorways, look as though they had been

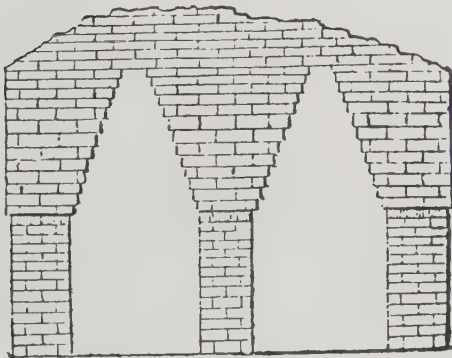
planned and built for miniature beings from another planet. The buildings resemble dollhouses clustered to form a town. The scale is even more astonishing after one has seen the great towering pyramids and palaces at Uxmal and Chichen Itza, (As quoted in R9)

This quotation confirms nicely Le Plongeon's old perception first quoted.

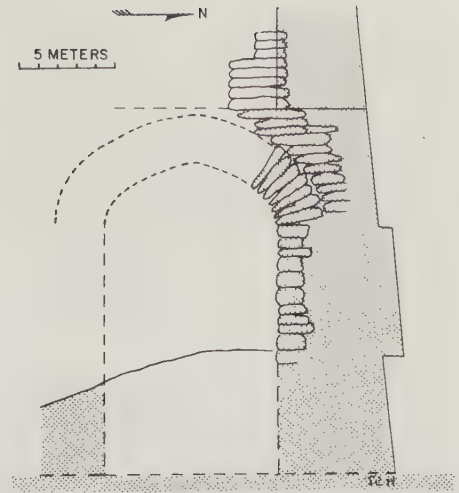
Of course the Maya were small in stature, but they were not dwarfs. One must wonder why they built so small. Actually, tiny houses with doorways less than 3 feet high are seen in many Maya sites. Archeologists dismiss these as "votary shrines," but Mayan tradition holds that they were used by a diminutive people called the "Alux"! (R9)

It would be easy to dismiss these old stories as exaggeration if it were not for other miniature Mayan structures. We refer in particular to the tiny tunnels at Monte Alban. (MSE3-X2 in Ancient Infrastructure) There, those tunnels that archeologists were able to explore were only 20 inches high; but there are other tunnels that were too small for them to squeeze into---less than 1 foot high!

True arches. The Maya certainly favored "false" arches such as those seen in the corridors at Uxmal. (See figure.) However, they apparently did know the principle of the true arch with its keystone. This is illustrated



Sketch of a corbelled arch at Uxmal. The Maya almost always employed this type of arch. (R2)



A probable true arch at La Muneca in southeastern Campeche, Mexico. True arches are rare in the Precolumbian New World. (R5)

at a site in Campeche, which was discussed by H. Befe and G.F. Ekholm.

While Chichen Itza does not provide the example to prove incorrect the often stated "rule"---that the true arch was unknown in the New World ---there is fairly good evidence that the principle was understood and applied at least once by the Maya. This occurrence is in Structure XII, Room 2, at the site of La Muneca in southeastern Campeche, that was discovered by a Carnegie Institution survey of the region in 1933. The vault was incomplete, unfortunately, but the evidence leaves little doubt that a true arch is indicated. (R5)

See the suggestive sketch and MSB3, where a South America arch is presented.

Stone softening. A notorious claim of fringe archeology states that the old engineers of the New World knew a way to soften stone through the use of the juice of a native plant. They ask, "How else could the Incan masons have fitted their huge stone blocks together so precisely?" (MSB3) In Mexico, we see some support for this wild claim.

In the 1930s, J.O. Outwater, Jr.,

an engineer from the University of Vermont, made a study of Mayan construction techniques. One of the buildings he examined was a temple at Mitla, in Oaxaca. This temple is ornamented by about 300,000 thin, flat pieces of stone. These tile-like pieces were derived from trachyte, a dense, durable rock that does not split easily like slate. How did the builders at Mitla ever obtain 300,000 fine, thin tiles from this obdurate material? Outwater suggested that the trachyte was softened before it was shaped!

What he feels is probably an important clue is a big stone cauldron more than four feet in diameter carved out of a boulder and completely immovable. The cauldron was found located near a quarry which must have been a major source of the Mitla stone.

Mr. Outwater reasons that the ancients must have dipped their stone into a softening agent, let it soak there until it was soft and then cut it to size, using a nearby stream to carry off the waste. (R4)

Outwater was not able to identify a probable softening agent. His experi-

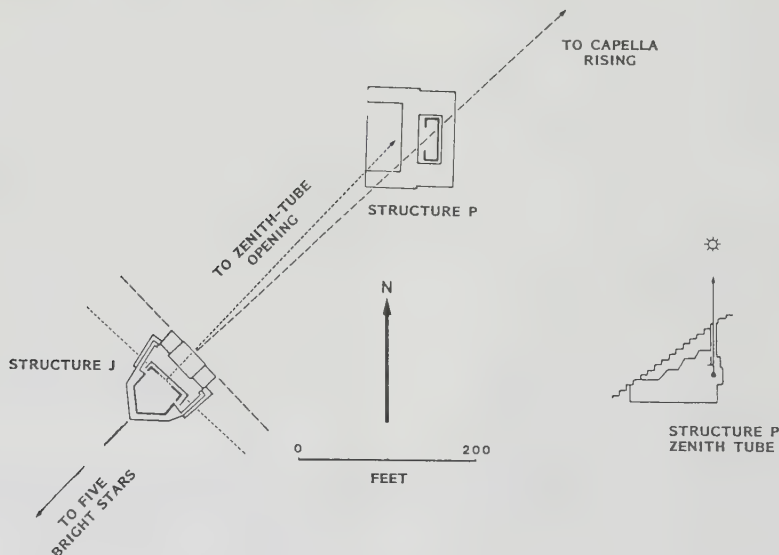
ments with vinegar, potash, and urine were negative.

This is interesting, but it is only circumstantial evidence.

Enigmatic building orientation. Besides the miniature tunnels mentioned above, Monte Alban is notable for a strongly skewed building---Building J. Most of Monte Alban's major buildings squarely face an avenue running north-south, but the steps of Building J face north-east. The orderly planners of Monte Alban must have had a good reason to destroy the site's geometry with this swiveled structure.

In addition to its anomalous orientation, Building J is arrow-shaped, suggesting that it was deliberately pointed at something. Given the Mayan passion for astronomy, the target was probably a star. Now the "arrow" of Building J does point southwest where, in 250 B.C., five bright stars set. Unfortunately, said stars do not signal any known significant terrestrial or calendric event. This particular orientation, therefore, does not seem important enough for the Maya to destroy the symmetry of the entire site.

In the opposite direction, though, A. Aveni discovered a better explanation.



Astronomical alignments and zenith-tube locations at Monte Alban. (Adapted from R7)

tion for Building J's skewness. A line drawn perpendicular from the stairway of Building J crosses the avenue and goes through an opening atop Building P. If continued beyond Building P, the line meets the horizon where the bright star Capella rose circa 275 B.C.---the time when Building J was constructed.

Capella would have been important to Mayan astronomers at Monte Alban because its first predawn appearance signaled the first of two annual zenith passages of the sun at the site---useful time markers. But one must ask if this connection between Buildings J and P and Capella was just coincidental?

In the 1960s, H. Hartung noticed that the foundation of the room atop Building J was skewed slightly to the north of the stairway. A perpendicular drawn from this room's doorway also intersected Building P, but at a spot where a zenith tube had been installed. Zenith tubes allow astronomers to tell when an astronomical object is directly overhead. Hartung's finding thus supported Aveni's contention about the purpose of Building J's curious orientation. (R7, R10)

All of this is surmise, although eminently reasonable. One problem is that zenith tubes have a rather wide field of view, and Mayan astronomers might have predicted zenith passages as the sun began to enter the instrument's field of view. Capella's rising may not have been needed to warn them. Building J's orientation may still be anomalous; i.e., unexplained.

Hidden messages in building design. Students of Egypt's Great Pyramid have read much into its geographical location and physical dimensions. (MSP8) The Great Pyramid is said to embody the laws of science, the history of the world, and suggest past visits of extraterrestrials! Does New World architecture likewise encode similar messages?

Of course, archaeoastronomers have noted many Mayan buildings with orientations of astronomical significance, but the possible deeper meanings of building placement and the subtleties of their ornamentation have received less attention.

A remarkable exception to this generalization exists at Uxmal, more specifically, in a curious group of four Mayan structures collectively called the Nunnery because that is what

the buildings looked like to early explorers. The real purpose of this architectural masterpiece is unknown, but it almost certainly did not house nuns!

In actuality, the Nunnery seems to transmit two coded messages to those with the eyes to detect them. The first hidden message is claimed to lie in the arrangement of the four buildings. So far, however, this message has not been deciphered. The second message, however, can be read in the symbology of the magnificent fretwork that embellishes the front the eastern building.

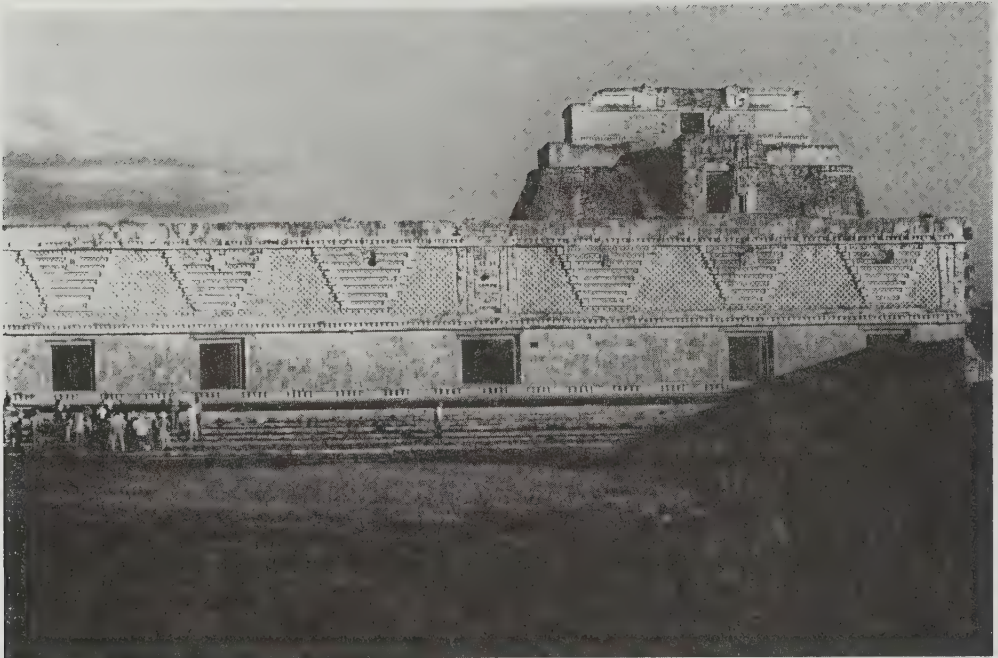
To discern the first message, we look at the Nunnery's geometrical layout. The four separate structures---undeniably beautiful---face a spacious patio. The buildings are low, flat, and each adorned with elaborate facades. Even without hidden messages, they are great works of art. As the Parthenon is to Greece, so the Nunnery is to ancient Mexico.

Despite their obvious beauty, the four buildings depart from perfection in odd ways. Each is placed upon a platform, but the platforms are of different heights. This disorder continues in the arrangement of the buildings; each is set at a different angle to the patio, forming a slightly irregular quadrilateral. Finally, each building has a different number of doors. This disorder does not diminish the aesthetic quality of the Nunnery, but it does encourage us to look for some underlying meaning.

A subtle sort of order in the disorder is discovered by drawing lines between certain doorways on opposite sides of the patio. Even though the buildings do not outline a regular quadrilateral, two pairs of these lines cross at almost exactly right angles in the middle of the patio! If this geometry has some meaning, we don't know what it is. It might be just coincidence, but one suspects that the meticulous Mayan architects did not place their buildings slightly askew for no reason. (R8)

In fact, one is reminded a Stonehenge's marvelous "rectangle" formed by four station stones. This precisely geometric rectangle exists only at Stonehenge's latitude in the Northern Hemisphere. (MSH18 in Ancient Infrastructure)

Until 1972, archeologists had ad-



The east building of the Nunnery at Uxmal, Mexico, looking east. (E.C. Krupp, Griffith Observatory)

mired the fretwork on the front of the Nunnery's east building, but it wasn't until W. Lamb, a Tulane anthropologist, started counting the elements of this ornamentation that its hidden meaning became apparent. (R8)

Lamb's 1980 paper in American Antiquity revealed that a surprisingly detailed amount of astronomical information seems to be encoded in the Nunnery's ornaments and structure. He wrote:

Counts of mosaic facade elements, doors, steps, and colonnettes in the East, West, and North Buildings of the Nunnery Quadrangle at the Maya site of Uxmal suggest that these features, taken together, preserve knowledge of eight facts about the sun, moon, and Venus. (R6)

Some of these astronomical facts are rather abstruse, so we relate only three:

- The moon's synodic period is 29.53+ days;

- The lunar sidereal period lasts nearly 27.33 days; and

- The Venus synodic mean is almost 584 days.

The Nunnery, therefore, seems the New World counterpart of the Great Pyramid in its subtle encoding of astronomical information. One wonders if other Mayan buildings also conceal facts from us. Also, why did the Maya go to all the trouble of encoding data in macroscopic form, when the same sort of information resides in their glyphs?

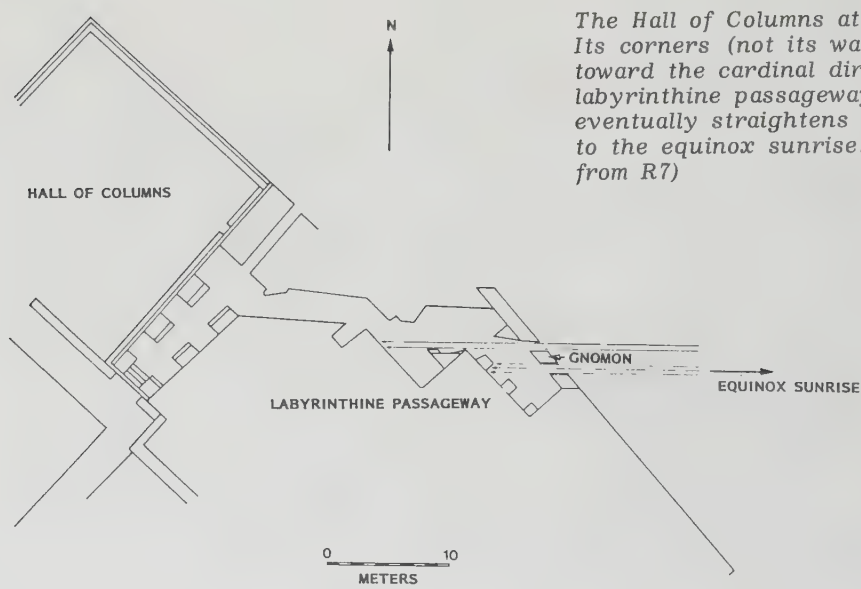
An interesting parallel to the Nunnery's symbology may reside in the decorations engraved on Tiahuanaco's Gateway of the Sun. (MGS in another volume)

Strange columns and a labyrinthine passageway. The Alta Vista site in northern Mexico is of modest size but it is host to two curiosities.

First, there is the aptly named Hall of Columns. In this Hall, some 20



The Hall of Columns is aptly named. Curiously, the 28 squat columns are inconveniently close together. (Robin Rector Krupp)



The Hall of Columns at Alta Vista. Its corners (not its walls) point toward the cardinal directions. The labyrinthine passageway on the right eventually straightens out to point to the equinox sunrise. (Adapted from R7)



The curious labyrinthine passageway at Alta Vista looking east. (E.C. Krupp, Griffith Observatory)

meters square, are squeezed 28 squat columns. They are so close together that one wonders how any ceremonies or other activities could have been conducted inside.

Even stranger is a gallery adjacent to the southeastern wall of the Hall of Columns. It is a zigzag, labyrinthine passageway about 25 meters long that exits into an excavated trench. Looking down the trench, one can see a distinctive peak that marks the equinox sunrise. Sunlight floods down the trench, past a gnomon, and down the strange passageway. It fills the labyrinth with eerie patches of sunlight

and shadows. It is easy to understand the astronomical value of the gnomon and trench, but the purpose of the zigzag passageway eludes us. (R7)

X2. Belize

An anomalous terrace. The Mayan site of Lubaantun seems to harbor a structure erected by an earlier culture. The structure in question is a megalithic wall built from very large, precisely cut stones without mortar. One does

find such walls in South America but usually not in Maya country.

T.A. Joyce mentioned this anachronistic wall in his report on Lubaantun in 1926.

Immediately to the south of Pyramid C, among the debris of the collapsed hill-terraces on the eastern face of the slope, our attention was attracted by certain blocks of worked stone considerably greater in size than those normally used by the Maya for building purposes. Excavation revealed three tiers of an inner hill-terrace, built of similar huge blocks, which had been covered in by an outer terrace system constructed of smaller and more regular stones. The three "risers" of the portion of terrace excavated measured 5 feet 9 inches, 5 feet, and 6 feet 6 inches, respectively; the two "treads," 7 feet and 6 feet 5 inches. The blocks of which they are composed are also crystalline limestone. These blocks are very well worked and laid, but they vary considerably in dimensions, one of the largest measuring over 5 feet long. Masonry of this character, which is more like that of Peru than of Central America, has not so far been discovered in the Maya area, and constitutes another peculiar feature of the Lubaantun district. Evident traces of white stucco are found on these blocks, and it is clear that the whole series of terraces was originally faced with this material.

The relation of these megalithic terraces to the pyramids is very



This megalithic wall at Lubaantun, in Belize, employs large, precision-fit stones. Such masonry is anomalous in Maya country but common in Incan Peru. (R3)

interesting. Though time was lacking to carry the excavation of the upper tier right up to Pyramid C, the line of the terrace seems to under-run the pyramid. If this proves to be the fact, then it is obvious that the terrace was filled in and faced with an outer skin of masonry before the pyramid was built. The megalithic style of the submerged terrace and the in-and-out style of the pyramid, therefore, belong to two distinct architectural periods, of which the megalithic is the earlier. (R3)

D.H. Childress wonders if Lubaantun was really a Mayan city. The usual Mayan steles, temples, and sculptures are strangely absent. The Lubaantun pyramids also have unusual rounded corners; that is, they are not typically Mayan. (R9) In view of these observations, the salient question must be: Who preceded the Maya at this site?

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MSB3**Miscellaneous Ancient Structures: South America**

Description. Ancient South American buildings, some which have no obvious purpose and others that are totally enigmatic in their complexity and seemingly frivolous design.

Data Evaluation. Sources are a mix of journal articles and popular archeology books. With the exception of the controverted claim of an immense ossuary in the Peruvian jungle, the reality of the selected buildings is demonstrated by photographs and careful sketches. The data evaluations are the first figures in the ratings below.

Anomaly Evaluation. The six selected buildings (there are doubtless more) are evaluated below in the second figures in the ratings. See X1 and X2 for discussions of the puzzling features and possible explanations.

- A labyrinthine building at Pacatmanu (X1). Ratings: 1/3.
- Another true arch in South America (X1). Ratings: 1/2.
- A totally enigmatic structure at Grand Chimu, Peru (X1). Ratings: 1/2.
- A row of thirteen identical, puzzling structures, in Peru (X1). Ratings: 1/2.
- A possible immense ossuary in Peru (X1). Ratings: 3/2.
- La Olla, a beehive-like structure at El Panecillo, Ecuador (X2). Ratings: 1/2.

Similar and Related Phenomena. Another true arch in Mesoamerica (MSB2-X1); enigmatic structures at Tiahuanaco (MSB5-X4); curiously carved rocks in Peru (MSO11 in Ancient Infrastructure); El Panecillo as a possible artificial mound or sculpted hill (MSM5-X3 in Ancient Infrastructure).

Entries

X0. Introduction. Hundreds of magnificent buildings raised by different cultures dot the west coast of South America from Columbia to Chile. Many were built by the Inca and the Chimu culture that preceded them. The most interesting of all, however, are located at Tiahuanaco in Bolivia. So perplexing are the structures at Tiahuanaco that we assign them to separate section. (MSB5) Another subject deserving of separate treatment concerns the marvelous stone masonry of the Incas. How did they fit those ponderous stones together to perfectly? (MSB4)

In the present section, we cover several unusual buildings in Peru and another in Ecuador that are curious and tax our powers of explanation.

X1. Peru

Labyrinthine buildings at Pacatamu. On a promontory overlooking the Pacific in northern Peru, sits a most odd building. The specific site is called Pacatnamu, and it was apparently a major religious center prior to the Inca hegemony. One of the structures at Pacatnamu is a complex labyrinth apparently designed for rituals and possibly as the abode of an oracle. The labyrinth is a high-walled maze occupying an area roughly equal to four football fields. The nature of the labyrinth was not appreciated until 1983, when C. Donnan began excavations there.

Donnan and his crew found sacrificed llamas and many exquisitely woven, tiny squares of cloth of no practical value---both signs of rituals of some sort. The discovery of most interest here was



The complex labyrinth at Pacatamu, Peru. This pre-Inca structure may have been intended to psychologically impress worshippers before rituals. (R5)

described by E. Hadingham.

But the most surprising discovery of all was the ground plan of the passages and rooms that led to the ritual areas. The complexity of the layout defies any practical explanation. For example, one of the elevated platforms is located just a few feet from the front entrance of the compound, yet to reach it, you must follow corridors running back and forth over nearly a quarter of the area of the enclosure. (R5)

Donnan ventured that the labyrinth was deliberately configured to disorient and befuddle visitors. The object was, apparently, to psychologically prepare them for the ritual or the declarations of the oracle to come.

A much simpler labyrinth, probably built for the same purpose, is the singular passageway at Alta Vista, Mexico. (See MSB2-X1.)

The true arch in South America. Four hundred miles south of Pacatamu at Pachacamac is another shrine. The catalogable feature there is an obvious true arch---very rare in the New World. E.G. Squier published the ac-

companying sketch in his classic travelog. (R1)



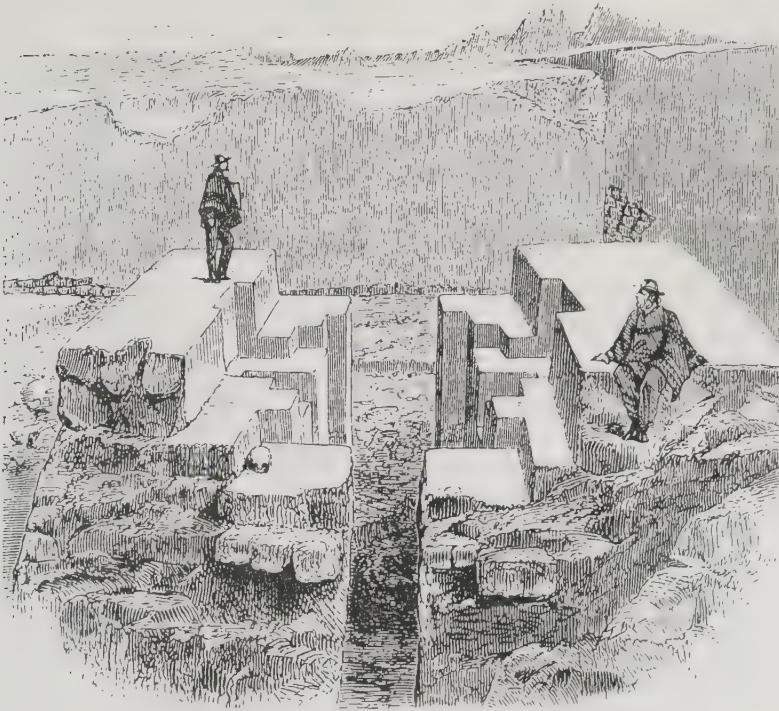
A "true arch" with a keystone as sketched by E.G. Squier at Pachacamac, Peru. (R1)



A "false arch" from South America.
No keystone. (R2)

A totally enigmatic structure. Besides the arch just mentioned, Squier described and provided a sketch of a most peculiar structure he found at a place he called Grand Chimu. He wrote:

Certainly the strangest, if not the most interesting, object disclosed in excavating these tombs was the regular and somewhat elaborate mass of adobes and rubble-work...[See the accompanying sketch.] The end towards the spectator is partly broken down; but, presuming it to have corresponded with the other, the structure was sixteen feet square, and twelve feet high, entered at each end by a door-way or passage three feet wide, leading into a kind of area, ten feet long by five wide. The sides of this area or court were furnished with a series of platforms and demi-niches impossible to describe, and only to be comprehended



At Grand Chimu, Peru, E.G. Squier came across this utterly incomprehensible structure. (R1)

by reference to the engraving. They were all plastered smooth, as were also the upper surfaces of the walls themselves, and here and there exhibited traces of having been painted. I am utterly at a loss to suggest even the purposes of this strange monument, unless indeed it was connected with unknown burial rites, in the course of which different grades of functionaries occupied the various graduations or seats of the interior. (R1)

This strange structure should be compared with the equally enigmatic carved stone blocks at Tiahuanaco. (MSB5-X4)

A peculiar row of structures. Buildings pique the curiosity of the anomalist not only for their design but also for their alignments with adjacent structures. In northern Peru, near Casma, there is a strange row of thirteen identical structures. These were described by C.v.S. Roosevelt as follows.

On a hill running parallel to the valley is a row of thirteen curious structures. On a facing hill is an immense fortress. The thirteen structures are aligned north and south and are about twelve feet apart. They are exactly alike and nearly square, about fifteen feet wide and almost twelve feet high,

built of uncut granite blocks placed with their smooth sides out. Cross spent considerable time trying to dig into one. He found the construction very solid, since the centers are filled with rubble on which is placed a layer of granite blocks forming the top. Down their north sides run stairs four feet wide. Standing on top of the hill, they overlook the whole countryside. Whether they were altars or had some connection with the thirteen lunar months is not known. (R4)

Why would anyone construct thirteen fairly large, essentially identical structures in a precise north-south line?

A questionable ossuary. The August 3, 1912, issue of Collier's Weekly carried an article entitled "A Prehistoric Peruvian Graveyard." The article featured a photograph of a structure supposedly located in the tropical jungle on the Ucayali River, Peru. The building was said to be 200 feet square and enclosed by a wall 25 feet high, without any entrances at all. It was filled with an incredible mass of human bones, reaching a depth of 18 feet in some spots. The total number of human skeleton was estimated at 72,000! (R2)

The Collier's story was challenged---as it should have been---in Science by W.H. Dall of the Smithsonian Institution. He was incredulous to say the least.



A row of 13 identical structures near Casma in northern Peru. They are aligned north-south. Purpose unknown. (R4)

Studying the photo, Dall noted that the vegetation was not tropical and the style of architecture was unknown among American aborigines. While he did not doubt the reality of the photograph, he stated unequivocally that the structure was not prehistoric, not South American, and not the product of a primitive people. (R2)

We have seen nothing more in the literature about this building. If it is not in Peru and not ancient, what was it? Whose skeletons were they? Did Dall dismiss the story too quickly? After all, many remarkable things have been discovered in South America since 1912!

X2. Ecuador

La Olla at El Panecillo. El Panecillo is a 600-foot-high hill within the city limits of Quito. It is cataloged as unusual in MSM5-X3 in Ancient Infrastructure, because there are geological hints that the whole hill might be artificial or perhaps a natural feature that was partly sculpted by human hands.

La Olla ("the kettle") is a strange structure perched atop El Panecillo. La Olla is shaped like a beehive with a tunnel-style entrance built with a true arch, over which is carved a sun symbol. The sun symbol suggests that La Olla might have once been an Inca observatory of some sort, but the only opening for astronomical observations is the large hole at the top of the building. Another proffered application is as a watchtower. Without windows and a

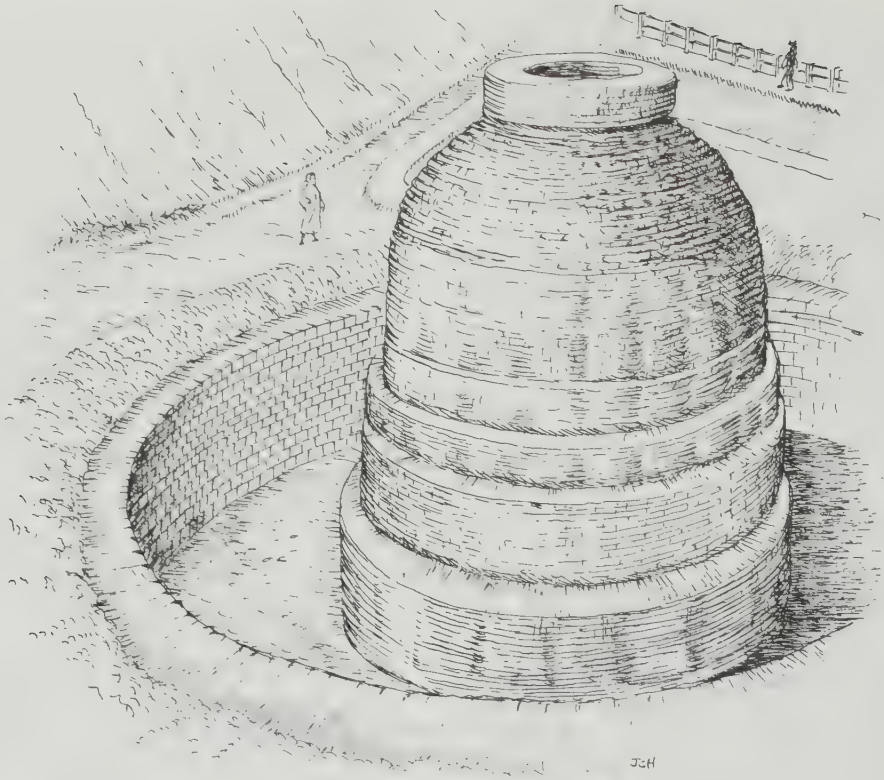
place on top to stand, this also seems unlikely.

The following description of La Olla by D.D. Zink provides no real clues as to purpose. La Olla remains a puzzle.

The so-called watchtower (or observatory) is constructed like a beehive of thin bricks and mortar. Inside, it is plastered and its internal dimensions are roughly twenty feet in height and ten feet in diameter with and eighteen to twenty-four-inch opening at the top and a seven-foot tunnel leaving it. The tunnel is excellent Inca masonry done with andesite. Set into the hillside, it is surrounded by a retaining wall of fine Inca masonry, also done with andesite. (R3)

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La Olla is a curiously shaped structure of ambiguous purpose located near Quito, Ecuador, upon a hill which may be artificial, at least in part. (R3)

MSB4

Puzzles of Inca Stone Masonry

Description. A suite of structural features observed in high-quality Inca stone structures that have eluded convincing, detailed explanations. In the broadest sense, archeologists and construction engineers remain uncertain as to exactly how the Inca transported multiton stone blocks to their building sites and then maneuvered and fit them together with great precision into interlocked positions in their walls. However, satisfactory construction scenarios do exist for simple walls using small stones.

Data Evaluation. Good photographs and abundant testimony in both professional and popular publications prove the structural complexity of the best Inca walls and confirm the 100-ton sizes of some of the building stones. Attempts to replicate Inca stonework has met with some success in simple structures, but several questions remain unanswered, as indicated below. The data evaluations are the first figures in the ratings.

Anomaly Evaluation. Six features of Inca stonemasonry require further explanation. Some of these are potentially highly anomalous, as the second figures in the ratings confirm.

- Interlocking stone blocks of large size. A convincing scenario for the fitting of these many-angled blocks does not exist (X3). Ratings: 2/1.
- The lack of drag marks on those stones fine-dressed at the quarries (X3). Here, the method of transportation is unknown (X2). Ratings: 1/2.
- No explanation exists describing how multiton stones were repeatedly lowered and lifted during the fitting process (X3). Ratings: 2/1.
- The lack of standing room for the thousands of workers needed to pull heavy stones up steeply inclined ramps (X2). Ratings: 2/3.
- Structural features consistent with the use of a stone-softening agent (X5). Ratings: 3/1.
- Affinities with ancient Egyptian construction: (1) similar cutting marks; and (2) similar protuberances (X2 and X4). Ratings: 3/1.

Possible Explanations. The Inca certainly had enough manpower available to drag and pound large stone blocks into the required shapes. These crude techniques were sufficient to explain the erection of simple (non-interlocking) walls using small stones. The use of a stone-softening agent is hinted at but very unlikely from a scientific point of view.

Similar and Related Phenomena. Precision stonemasonry at Tiahuanaco (MSB5-X1); precision-fit megalithic walls (MSW3 in Ancient Infrastructure); the presence of immense stone blocks at Baalbek, Lebanon (MSB8); the quarrying, transportation, handling, and fitting of stone blocks in the Great Pyramid (MSP6); "poured pyramids" (MSP6); evidence of a possible early Egyptian presence in the New World (MAM, MGG, MGP, MGW in future volumes).

Entries

X0. Introduction. It is a rare article or book on the Inca culture that does not mention the exquisite perfection of some of the Inca stonework. Photographs and drawings of the walls at Cuzco are often offered as examples of stonemasonry so fine and precise that "a knife blade cannot be inserted between the stones." Of course, many Inca walls are rougher and cruder than these Cuzco walls; but when they so wished the Inca engineers built so well and employed stones so large that we are pressed to explain how they quarried, transported, handled, and then

fit their multiton stones together so precisely.

To some observers, the excellence of Inca stonework seems beyond the capabilities of a culture equipped with only the crudest of tools and without the wheel. In fact, as is often pointed out, modern engineers would be hard put to transport and manipulate 100-ton stone blocks. As a consequence of this general amazement---of laymen and professional archeologists alike---some radical theories have emerged. The use of a stone-softening agent, antigravity devices, and laser stone-cutters have



Inca stonework. Note the size of the blocks and the precision of the fits, not only on the exposed face of the wall but also through the thickness of the wall. (C. Casale)

been mentioned in the fringe literature. We really do not need to go quite so far. We recognize that the Inca were excellent engineers with lots of time and manpower at their disposal. It is our purpose to address the question of whether these assets were enough to dispose of the potential anomalies mentioned above under Anomaly Evaluation.

X1. Testimonies relative to the excellence of Incan stonemasonry. The construction of the Incan megalithic walls can be divided into the following activities:

- Quarrying the stones;
- Rough dressing at the quarries;
- Transportation to the construction site;
- Handling of the large stones during construction; and
- Fine dressing and fitting.

The magnitude of the accomplishments the Inca engineers was nicely summed up by V.W. Von Hagen in his discussion of the great so-called "fort" at Sacsayhuaman.

How the Inca mason achieved pre-

cision like this is still largely a mystery. The sheer scale is astonishing---one stone in the fortress is 27 feet high and weighs 200 tons. Somehow the Inca engineers, with only stone hammers and axes, bronze chisels, sand abrasives and wooden crowbars and rollers, managed to quarry these monsters, shape them, transport them distances ranging from nine to twenty miles, and finally place them exactly down a hundred times until they fitted so perfectly on all their sides. No mortar is used, yet there is not a crack for the thinnest blade to be inserted. (R3 as quoted in R4)

It is important to recognize that the best Incan walls were not laid like courses of modern bricks. The multiton stones were "interlocked" and touched their adjacent companions on several faces. This interlocking strengthened the structures against the shocks of earthquakes but it also compounds our problem of explanation. G.M. Phillips testified as follows on this point.

I have examined the stonework of Peru at the fortress of Sacsayhuaman, in the walls of the city of Cuzco, at Ollantaytambo and at Machu Picchu and I have observed one important factor peculiar to the jigsaw-puzzle type of construction which is attributed to the ancients---that the stones are not simply fitted together with snugly-fitting smooth faces, but that in many cases they are interlocking! The stones have been deliberately shaped to tie together to give support; not merely by one stone resting upon another, but by shaping each stone in such fashion so that each surface of every stone gives structural support and stability to its neighbor. This is not by accident, but by design. How else could a stone wall perched atop a mountain peak have remained intact and withstood the ravages of storms and earthquakes for hundreds or thousands of years? (R4)

This interlocking feature is highly obvious in the "stone of twelve corners" at Cuzco. Anthropologist M.K. Jessup speculated about this fine example of Inca craftsmanship back in 1934.

It has often been pointed out that the workmanship in Inca masonry is of a superb nature with joints so perfect as not to permit the penetration of a penknife. It is a further matter of note that each stone is so formed that it can occupy one and only one position in the walls, and that no mortar was used in the construction. It is the purpose of this paper to explain the first two points and show that mortar is unnecessary.

Let us study [the figure]. This is the famous "stone with twelve corners," which is often cited as an example of the careful forethought used in planning a wall so that each stone fits in a certain niche. On a casual inspection of this stone it occurred to the writer that the stones were not quarried to these weird shapes, but were quarried roughly and then ground to their final shape in situ. The photos seem to prove this assumption.

In [the figure] we may assume the lowest layer to be in place. The mason then lays the rough stone, No. 1, on the wall and his helpers proceed to fit it by pulling it back and forth at right angles to the face of the wall until its left hand and bottom surfaces fit perfectly against those of their neighbors. Large twelve-cornered stone, No. 2, was next in place. The curvature of the joint, 1-2, and the rounded corners indicate a grinding in situ. Third in place was No. 3, again with a curved joint. Numbers 4, 5, 6, 7, 8, 9, were put on in order, each being perfectly fitted before the next was started. Notice how No. 4 was worked in as a wedge under its own weight. The rounded corners and curved sides are a natural result of grinding. Corners 4-5-6, 2-7-8, and 2-8-9 are especially interesting in this respect. (R1)

In the foregoing quotation we see how the stone-fitting might have been done. There would have been laborious grinding of one stone against another accompanied by endless raising, lowering, and sliding back and forth of heavy stones. Such might have been possible with the smaller stones in the Cuzco wall, but when we come to 100-ton stones at Sacsayhuaman this tech-



The famous "stone of twelve angles" in wall at Cuzco, Peru. The numbers refer to the discussion in the text. (R1)

nique stretches our credulity. We will return to this subject in X3.

X2. A transportation problem? According to J.-P. Protzen, a scientist who studied and experimented with Inca stonemasonry techniques, their quarrying operations posed no serious challenges. Often, stones of nearly the proper sizes were already broken off the quarry rock faces. If not, the quarrymen pried blocks free with meter-long bronze bars. Stones were next rough-dressed at the quarries using simple stone hammers, such as nearby river cobbles. (R5)

Protzen did make an observation that would make any anomalist prick up his or her ears. Some of the cutting marks at Inca quarries closely resemble those observed on the pyramidion of the unfinished obelisk at Aswan, Egypt. The

thought of transoceanic diffusion comes to mind but should be suppressed on this minor matter!

After the rough-dressing, the stones, some weighing 100 or more tons, had to be moved to the construction sites, some of which were over 20 miles distant. Studying the blocks at Ollantaytambo, Protzen asserted that the polish and striations seen on some of the block faces prove that they had been dragged most of the way from the quarries along stone ramps. Rollers or skids, however, may have been employed on uphill sections of the road.

But Protzen admits to a transportation problem. The largest block at Ollantaytambo weighs about 140 tons. One of the stone ramps at this site has a 10° slope. Dragging the 140-ton block up this particular ramp would have required a force of roughly 120,000 kilograms. Optimistically, at least 2,000 men would have had to find places to stand and tug on a vast

skein of ropes to move this monster stone up the incline. It is difficult to see where this stone-moving army might have stood. At Ollantaytambo, the ramps are only 6-8 meters wide! (R5)

A second transportation conundrum involves the stone blocks quarried at Ollantaytambo's Rumiqlolqa quarry. These particular blocks were fine-dressed at the quarry but exhibit no drag marks at all. Protzen cannot suggest how they might have been transported. (R5)

X3. Fitting the stone blocks. After the stone blocks reached the Inca construction sites, they had to be shaped so as to fit tightly into place. M.K. Jessup, in X1 above, thought that the stones were lifted into place and then rubbed together until the adjacent surfaces were ground down to where that proverbial knife blade could not be inserted. (R1)

J.-P. Protzen took a different tack. Experimenting with rough stones---smaller than those used by the Inca, of course---he convinced himself that simple pounding the stone surfaces of the blocks-to-be-fitted with hammer stones was crude but very effective in preparing surfaces. The hammer stones could be dropped on the stone faces; they would actually bounce back into the workers' hands and could then be dropped again and again with minimum exertion. Little by little, the target surface would be reduced to powder.

Protzen observed that the upper surfaces of the stones in the Inca walls were usually slightly concave. The corresponding lower surfaces of the next course of stones were slightly convex. The upper course was in effect mated to the lower one. The Inca procedure, he surmised, consisted of first roughly preparing the concave and convex surfaces and then lowering the upper block to check the fit with the lower block. Poorly matching surfaces could thus be determined and pounded into the proper geometry. By repeatedly raising and lowering the upper stones, the masons could pound the surfaces until good fits were obtained.

Protzen tested this technique with smaller stones and found that he could achieve good fits quickly and easily.

While Protzen was convinced that he had discovered how the Inca masons constructed their precision-fit walls, he conceded that he did not understand how the Inca repeatedly lowered and raised their multiton stone blocks. (R5) Did they know about mechanical advantage and cranes?

An interesting observation emerging from Protzen's work is that the Incan convex-concave joints between stone courses could not have been obtained by simply rubbing the stones together, as assumed by M.K. Jessup in X1. One cannot slide nesting blocks back and forth.

Furthermore, Protzen experimented only with the simplest situation: one stone being fitted to another stone directly below. Would his technique have worked with complex, interlocking stones?

X4. The protuberances. Visitors to Inca sites are quick to remark on the strange protuberances present on many of the stones in even the finest of walls and buildings. First of all is the question of why the Inca did not pound them off, for they do mar the beauty of the masonry---at least they do to us today. Secondly, it is obvious that the protuberances in their present shape would be valueless in attaching ropes for handling of the stone blocks; they do not protrude enough!

Actually, the protuberances seen on the finished walls are the stubs of larger, utilitarian protuberances that the Inca employed at their quarries. According to Protzen, three kinds of protuberances were used, as illustrated, but these were usually pounded off to stubs before leaving the quarries. This fact can be demonstrated by examining the stones abandoned along the roads from the quarries; their protuberances are already been reduced to useless sizes. Evidently, the Inca did not need the full-size protuberances during the transportation phase nor for the handling of the blocks at the building sites. We thus are left to wonder just how the Inca secured ropes to the huge stones during these phases of their work.

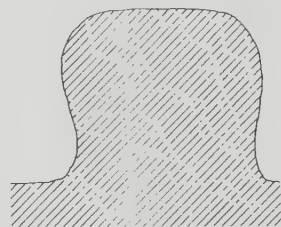
A final protuberance conundrum is seen in a photograph presented in an issue of the Ancient American by R.C.



Fine Inca stonework exhibiting the typical but still enigmatic protuberances. Some stones display them but others, though virtually identical, do not. (C. Casale)

Smith. It shows the interior of the Osireion, that enigmatic ancient building near Abydos, in Upper Egypt. (MSB11-X3) Some of the Osireion's building stones display protuberances identical to those seen on Incan masonry. (R8)

We are left to ponder over how the Egyptians used these protuberances; why they also allowed them to mar the beauty of their building; and whether or not the protuberances represent independent invention or cultural diffusion of a most radical nature!



X5. The claim of a stone-softening agent. Those who cannot support Jesup's theory (fitting by mutual abrasion) or Protzen's claim (fitting by trial-and-error pounding) have the option of choosing that fixture of avant garde archeology: "stone-softening." It is an old idea. When H. Bingham, discoverer of Machu Picchu, roamed South America

(Top) A type of protuberance that seems suitable for the application of levers. (Bottom) This type of protuberance might be useful for the attachment of ropes. (R5)

in the early 1900s, he heard native tales of a plant with reddish leaves, the juices of which could soften stones and make them malleable. Later, P.H. Fawcett related similar anecdotes relating to the Inca use of a stone-softening agent. (R2, R6)

Stones with softened surfaces would certainly have made the work of the Inca stonemasons easier, but nowhere in the science literature we have examined do we find strong, direct evidence of a stone-softening agent. But, there are indirect hints.

In MSB2-X1, for example, we reported the suspicions of J.O. Outwater, Jr., expressed during his research at Mitla, in Mexico. He wondered how the Maya had made thin tiles out of hard stone. His imagination was fired further by the discovery of a huge, curious, stone cauldron at the site! Could the Maya have soaked stones in some chemical to soften them before making their tiles?

There are also several other observations that make us wonder whether we really know everything about Inca stonemasonry.

- Some of the stones at Ollantaytambo seem to display smooth, plane surfaces that resemble "form marks"; that is, flat surfaces created by a mold. (R7)

- On some very large stone blocks, there appear to be traces of medium-sized stones hidden just beneath the surface. These seem to have been "plastered" over with a stone layer. (R7)

- It has been speculated that if

stone softening were used by the Inca, the reaction might well be exothermic. The resulting heating might account for the characteristic frontal bulges on many stones and perhaps even be associated with the frequent protuberances.

In the context of stone-softening, it is pertinent to mention J. Davidovits' theory that the ancient Egyptians poured or molded some of the stone blocks we see in their pyramids. (MSP6)

References

- R1. Jessup, Morris K.; "Inca Masonry at Cuzco," American Anthropologist, 36:239, 1934. (X1)
- R2. Berlitz, Charles; Mysteries from Forgotten Worlds, Garden City, 1972, p. 83. (X1)
- R3. Von Hagen, Victor W.; The Ancient Sun Kingdoms of the Americas, London, 1973, p. 291. (X1)
- R4. Phillips, Gene M.; Ancient Skies, 12:1, May-June 1985. (X1)
- R5. Protzen, Jean-Pierre; "Inca Stonemasonry," Scientific American, 254: 94, February 1986. (X1)
- R6. Childress, David Hatcher; Lost Cities & Ancient Mysteries of South America, Stelle, 1986, p. 74. (X1)
- R7. Casale, Charles T.; "The Inca Stones Speak," privately published report, November 3, 1996. (X1)
- R8. Smith, Roberta C.; Ancient American, no. 12, p. 2, 1996. (X1)

MSB5 Tiahuanaco: The Baalbek of the New World

Description. Buildings and other structures at Tiahuanaco, located at 12,000 feet-plus in the Bolivian Andes, that are notable primarily for the sizes of the building blocks, the precision and intricacy of the stone-working, and, in some cases, the unknown purpose of the structures. The most remarkable structures are found at Puma Punku, the supposed ancient port of Tiahuanaco, about a kilometer from the city proper.

Data Evaluation. All of our sources are popular books and magazines, some of which promote controversial interpretations of the Tiahuanaco ruins. Nevertheless, these same sources provide abundant illustrations and photographs of the subject buildings. Our data evaluations are the first figures in the ratings below.

Anomaly Evaluation. Seven curiosities and potential anomalies involving buildings at Tiahuanaco have been identified. The anomaly evaluations are the second figures in the ratings below.

- The great size and precision craftsmanship displayed in the building stones (X1). Ratings: 1/3.
- The extraordinary disarray of the huge building stones at Puma Punku (X2). Ratings: 1/2.
- The use of metal clamps in building construction (X3). Ratings: 1/3.
- The presence of many hard stones expertly carved in inexplicable and enigmatic shapes (X4). Ratings: 1/2.
- The unplumbed purpose of Puma Punku (R5). Ratings: 3/1.
- The similarity of supposed "death chambers" at both Tiahuanaco and in ancient Egypt (X6). Ratings: 3/1.
- The claimed existence of submerged ruins in Lake Titicaca resembling those at Tiahuanaco (X7). Ratings: 3/2.

Possible Explanations. The unorthodox interpretation of Tiahuanaco and its supposed port, Puma Punku, states that the city is very ancient (over 10,000 years old); that it was a busy port on Lake Titicaca (then 100 feet higher); and that it was a major feature of a global civilization that existed before the rise of ancient Egypt! The influence of ancient astronauts is often suggested! Mainstream interpretations, needless to say, posit a much younger, geographically contained, less precocious culture minus alien technology.

Similar and Related Phenomena. The immense stone blocks at Baalbek, Lebanon (MSB8); enigmatic carved stonework in Peru (MSO11 in Ancient Infrastructure and MSB3); evidence of recent catastrophism in the Andes (ESB6 in Anomalies in Geology); evidence of ancient Egyptian presence in the New World (MAM, MGG, MGP, MGW in future volumes); Incan stone masonry (MSB4); the Kalasasaya as an astronomical observatory (MSA1-X2); the Akapana mound (MSM5-X3 in Ancient Infrastructure); the Gateway of the Sun (MSO13 in Ancient Infrastructure).

Entries

X0. Introduction. The title of this section is taken from Chapter 15 of E.G. Squier's archeological 1877 travelog Peru: Incidents of Travel and Exploration in the Land of the Incas. As all anomalists with a bent for archeology know, Baalbek lies about 3,500 feet above sealevel in Lebanon and is noted far and wide for several truly massive building stones, some of which exceed 1,000 tons. (MSB8) In contrast, Tiahuanaco is perched at over 12,000 feet in the Bolivian Andes. It, too, is renowned for large building stones. However, the largest Tiahuanaco building blocks weigh only 100-130 tons. While dwarfed by those at Baalbek, they are nevertheless much larger than those at Stonehenge and, in addition, are precisely cut and dressed. Furthermore, the Tiahuanaco stones were quarried, shaped, and transported in air so rarefied that lowlanders gasp for breath while merely strolling around this ancient city.

Tiahuanaco is ancient. Some unconventional archeologists claim it is the oldest city in world---built 17,000 years ago! But the official modern view holds that Tiahuanaco's culture was ascendant in southern South America between 600 and 1,000 A.D., and that people were living at the site 2,000 years earlier. In this mainstream scenario, Tiahuanaco's age is not anomalous.

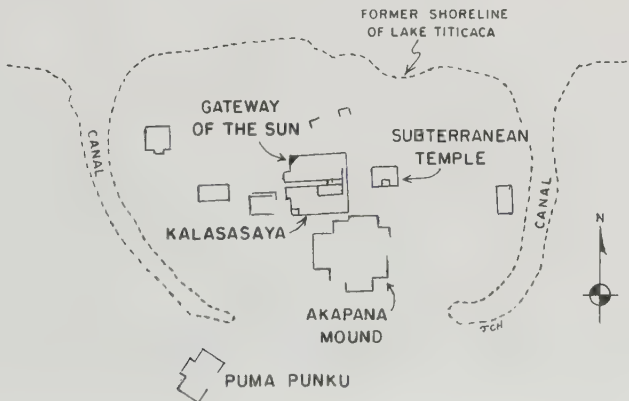
Tiahuanaco, however, is important to the anomalist for many other reasons.

In this section, we attend to the city's impressive and enigmatic buildings, in particular the jumble of huge building stones at a spot called Puma Punku about a kilometer from Tiahuanaco proper.

Two other puzzling features of Tiahuanaco are covered in our companion catalog volume Ancient Infrastructure; namely, the exquisitely carved Gateway of the Sun (MSO13); and the Akapana, which we classify as a mound but which some call a stepped pyramid. (MSM5-X3)

X1. The stones of Tiahuanaco. When E.G. Squier strolled around the ruins of Tiahuanaco in 1864, the city had already been extensively vandalized by treasure-seekers. Construction workers from nearby La Paz had also carried off whatever stones they could manage. Happily for archeology, they were not capable of budging many of them. Much remained for Squier to wonder about. His overall impression of Tiahuanaco's megalithic architecture reads as follows:

Rows of erect stones, some of them rough or but rudely shaped by art; others accurately cut and fitted in walls of admirable workmanship; long sections of foundations, with piers and portions of stairways; blocks of stone with mouldings, cornices, and niches cut with geometrical precision; vast masses of sandstone, trachyte,



*Map of Tiahuanaco showing its major features.
(Redrawn from R10)*

and basalt but partially hewn; and great monolithic doorways, bearing symbolical ornaments in relief, besides innumerable smaller, rectangular, and symmetrically shaped stones, rise on every hand, or lie scattered in confusion over the plain. (R1)

The primary building material at Tiahuanaco was sandstone, which was quarried 5-10 miles away. Many of these sandstone blocks, as Squier remarked above, were nicely squared and fitted. Some of the largest are to be seen in the remains of a building now called the Kalasasaya. Squier measured one of these stones that was still erect as being 14 feet high, 4 feet two inches wide, and 2 feet 8 inches thick.

It is at Puma Punku, however, just a kilometer outside the city proper, where the largest building stones are found. Here, we quote T. Morrison, a more recent visitor to Tiahuanaco.

Some of the stone blocks used in the Puma Punku were truly massive and bear comparison with the size of the shaped stones used at Stonehenge. The largest single block of the Puma Punku is of sandstone over twenty-five feet long with a volume exceeding 1,500 cubic feet and weighing between 100 and 131 tons. If this stone came from the nearest sandstone quarry it represents a massive expenditure of human energy. (R5)

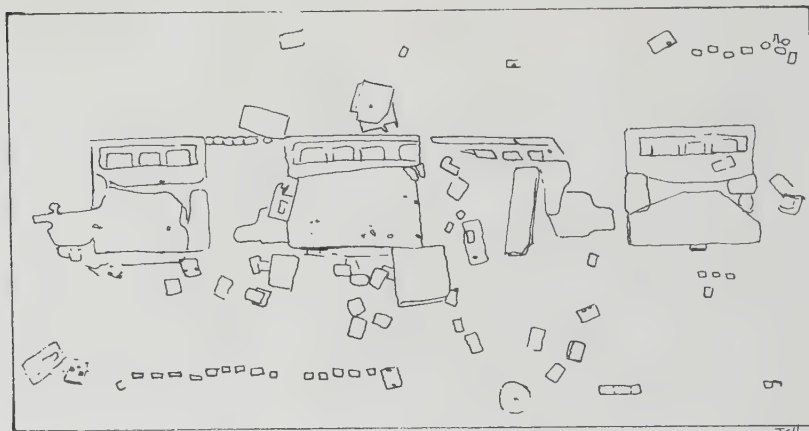
In contrast, the largest stone at Stonehenge weighs only 30 tons. Even so, archeologists have been speculating for decades about how megalithic man ever managed to transport Stonehenge's stones.

If we rate Stonehenge, Tiahuanaco, and Baalbek building stones for size and associated transportation problems, the Puma Punku stones emerge somewhere in between; bigger than Stonehenge but much smaller than Baalbek. But Stonehenge and Baalbek were built nearer sea level, not at over 12,000 feet. When Tiahuanaco's thin air is factored in, we have to be impressed by the skills of the Tiahuanaco engineers.

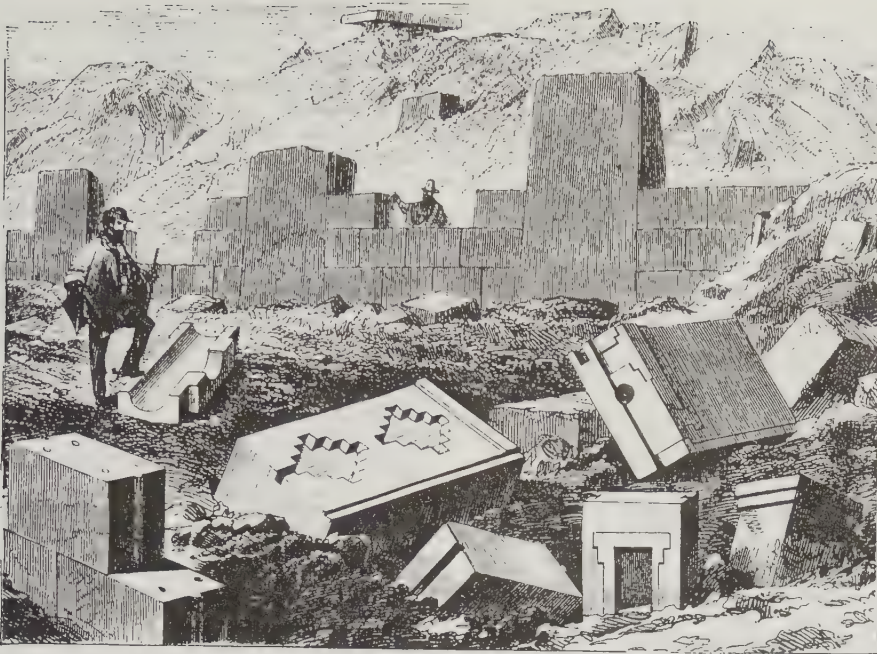
X2. The disarray of Puma Punku stones.

Apparently, Puma Punku was originally a rather complex, four-section building of some sort. It's hard to tell just what it was because its stones are strewn about like match sticks. This disarray suggests either a great natural catastrophe or wanton destruction by human hands.

Given the frequency of Andean earthquakes, a natural catastrophe seems the best bet. A strong quake would not only have toppled buildings but it would have created up a massive incursion of water (a "seiche") from



The present disposition of some of the scattered stone blocks at Puma Punku. (R8)



Sketch of the Puma Punku's jumbled stone blocks as seen by E.G. Squier over a century ago. (R1)



Recent photograph of part of the lithic disarray at Puma Punku. Note the intricate stone carving. (C. Casale)

Lake Titicaca, which a couple thousand years ago was about 100 feet higher and lapped at the edges of Tiahuanaco. This postulated seiche or tidal wave might have torn Puma Punku apart, but 100-ton stones are hard to move. Still, much of Tiahuanaco, even some of the structures on higher ground, were once covered with 6 feet or so of earth. This could have been another consequence of a giant seiche from the quake-disturbed lake. It is strange, though, that the smaller building stones of Tiahuanaco proper, just a few hundred meters from Puma Punka, do not seem to have been thrown down and scattered to the same extent.

Although a natural phenomenon is the most likely explanation of Puma Punku's disarray, some historical revisionists have speculated that Puma Punku was really built before Tiahuanaco proper and by an entirely different culture. A subsequent culture might have deliberately destroyed Puma Punku to erase traces of their predecessors---much as was done with the giant statues on Easter Island. But this is all surmise.

X3. Metal clamps at Puma Punku. One of the more curious finds at Puma Punku is the use of T-shaped slots in some of the large stone blocks. (See illustrations.) It is almost inescapable that these indentations once held I-shaped metal clamps that bound adjacent building blocks together. Some observers have supposed that these clamps were made of gold (a bad choice structurally speaking), silver, or copper. However, Z. Sitchin states that some clamps were bronze and that a few have actually been found. (R8) Bronze is an alloy of tin and copper, both common metals in ancient South America. Bronze was chanced upon early by precocious South American metallurgists, so its use at Tiahuanaco actually challenges no paradigms.

More interesting is the fact that similar I-shaped clamps were also employed at the Inca site of Ollantaytambo in Peru and also on the island of Elephantine in the Nile River. (R10) The Incas could easily have acquired the I-clamp idea from Tiahuanaco, but waxing conservative, we assume that architects at Tiahuanaco and Egypt conceived the clamp idea independently. After all, it is not a very complicated concept. We



Photograph of two T-shaped indentations in Puma Punku stone blocks. These probably once held metal clamps.

therefore should not use the metal I-clamps as strong evidence of early Egyptian influence in the New World.

X4. Enigmatically configured stone blocks at Puma Punku. At Puma Punku and elsewhere in South America (MSB3), visitors and archeologists alike puzzle over many weirdly carved stone blocks. These blocks defy description, so readers should look at the sketches provided. The blocks are of interest to the anomalist for two reasons.

(1) The andesite used at Tiahuanaco is a very hard rock to work with any kind of tools. It is difficult to see how the Tiahuanaco stone carvers precisely cut all the sharp corners, grooves, and niches in the figured blocks with their bronze tools.

(2) No one has the remotest idea

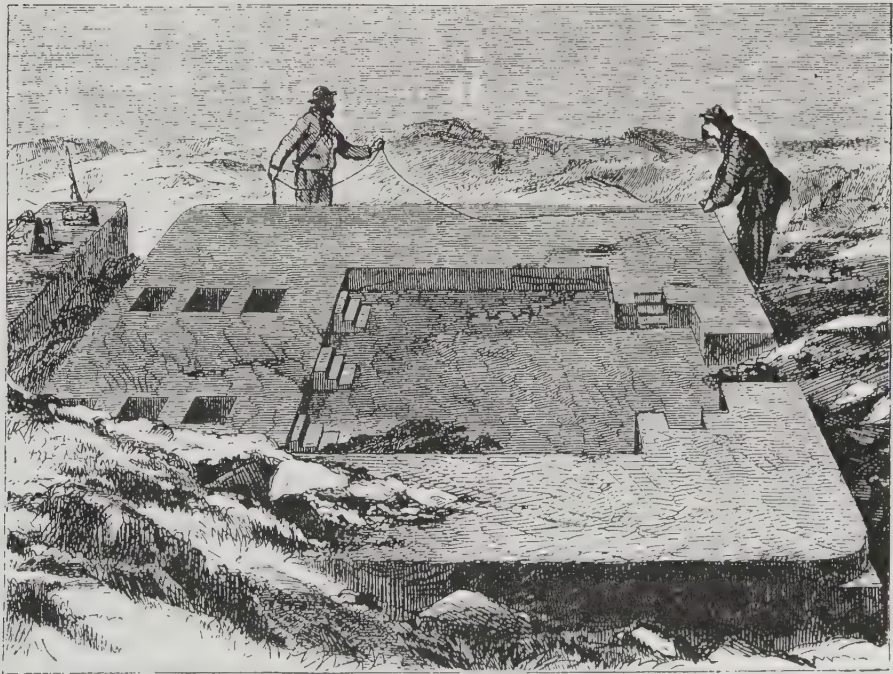
what these complicated shapes of stone were used for.

In the same vein is another strange slab of stone, again cut with admirable precision, that seems to be a scale model of some larger structure. Squier described it in these words:

In the center of this area there seems to have been a building about fifty feet square, constructed of very large blocks of stone, which I have denominated the "Sanctuary." Within this, where it was evidently supported on piers, is the distinctive and most remarkable feature of the structure. It is a great slab of stone 13 feet 4 inches square, and 20 inches in thickness. It is impossible to describe it intelligibly. and I must refer to the engraving for a notion of its character.

.....

I cannot resist the impression



E.G. Squier's sketch of one of Puma Punku's enigmatic carved stones. Squier labeled this a "Symbolical Slab." The stone's purpose is difficult to imagine. (R1)

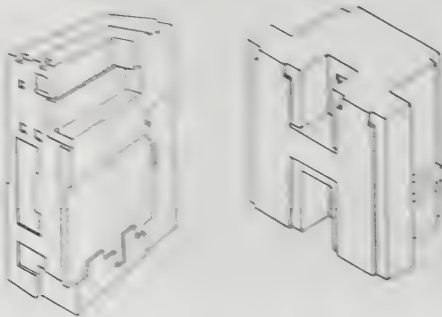


Recent photograph of Squier's "Symbolical Slab." The knapsack at the right provides scale. (C. Casale)

that this stone was intended as a miniature representation or model of a sacred edifice, or of some kind of edifice reared by the builders of the monuments of Tiahuanaco [sic]. (R1)

The ancient cultures of South America left behind many other enigmatically carved stones. One at Kenko, near

Cuzco, Peru, seems to represent an entire city. (See MSO11 in Ancient Infrastructure) If these elaborate carvings are truly models, the full-scale structures have never been found. Perhaps they are simply an "artform" that we do not appreciate!



The intricate geometry of some of the stones at Puma Punku defies easy explanation.

X5. The uncertain purpose of Puma Punku. Early in the Twentieth Century, A. Posnansky, a German-Bolivian scholar, spent years at Tiahuanaco trying to decipher its meaning. His four-volume work Tiahuanacu: The Cradle of American Man (1945) is a cult classic today. Based upon the alignments of some of the buildings at Tiahuanaco, which he assumed were originally oriented with respect to the sun, Posnansky put the age of Tiahuanaco at about 17,000 years---some 15,000 years earlier than the dates accepted by today's mainstream archeologists. (MSA1-X2) If one can accept Posnansky's date, Tiahuanaco would be the oldest city in

the world and, indeed, cultists insist just that!

Posnansky also had unorthodox ideas about Puma Punku. It was, he asserted, Tiahuanaco's thriving port circa 15,000 B.C. At that date, Lake Titicaca may have been 100 feet higher, with a shore-line just outside Tiahuanaco itself instead of 20 miles distant as it is today. The huge, jumbled blocks of stone that we see today, according to Posnansky, once constituted great piers and docks, where hundreds of ships could be loaded and unloaded simultaneously! (R10)

Posnansky's interpretations of Puma Punku still survive in the fringe literature. Of course, it could have been a harbor facility. In fact, there seem to be the remains of a canal leading to Puma Punku from the ancient shoreline of Lake Titicaca. However, one must ask these questions: Where did all the postulated ships come from and sail to? What cargoes did they carry? There seems to be little evidence of the busy lake commerce described by Posnansky. (R8)

Puma Punku has also been labeled a "temple." This, too, is only a guess. If we could somehow put all the scattered puzzle pieces of Puma Punku back together, we might be able to discern its purpose for certain. For the moment, the harbor theory seems the most reasonable---but a harbor not as old, not as huge, and not as busy as Posnansky declared.

X6. "Death chambers" in Egypt and at Tiahuanaco. In his Sailing to Paradise, diffusionist J. Bailey presents a figure depicting a smallish structure located at Tiahuanaco called a "death chamber." This building is distinguished by a small hole in the ceiling supposedly made for the passage of the "bird of death." This interpretation is inspired by the observation that the Tiahuanaco death chamber is essentially identical to bona fide ancient Egyptian death chambers. (R8)

This Egyptian association can be added to the metal clamps of X3 to add strength to the diffusionists' claim of an early Egyptian influence in the New World. Naturally, such suggestions are ridiculed by mainstream archeologists.

The ancient Egyptians did undertake lengthy sea voyages, perhaps even to Australia, but having them visiting Lake Titicaca in the high Andes several thousand years ago stretches credulity.

X7. Submerged ruins in Lake Titicaca. Even more unorthodox than the death-chamber claim is the 1980 announcement that Lake Titicaca, even in its modern low-water state, hides ancient buildings resembling those at today's high-and-dry Tiahuanaco. According to a dispatch by Reuter's, this supposed discovery was made by a New York-based film crew that was visiting Tiahuanaco to make a documentary about the Ayamaras, the Indian tribe that preceded the Incas.

During the making of the film, an old Indian led the crew to a rock jutting out of Lake Titicaca. One of the crew dove into the water to explore what lay beneath the rock and discovered that:

...it was part of a man-made construction going all the way down to the bottom of the lake. (R9)

Diverted from their original purpose, the film crew took underwater footage of structures that can only be termed "fantastic."

There was footage showing paved roads and algae-covered roofless walls and remains of various buildings made of rocks similar to those of the 23-foot high "gateway" of the Tiahuanaco remains. (R9)

The above tale was printed in some American newspapers; e.g., the Baltimore Sun of February 15, 1981. Caveat emptor.

References

- R1. Squier, E. George; Peru: Incidents of Travel and Exploration in the Land of the Incas, New York, 1877, pp. 272-301. (X1-X4)
- R2. Anonymous; "The Ancient Ruins of Tiahuanacu," Pan American Union,

- Bulletin, 37:513, 1913. (X1)
- R3. De Ward, Sable; "An American Babylon," Pan-American Magazine, 31:108, July 1920. (X1)
- R4. Sanderson, Ivan T.; "Things", New York, 1967, p. 74. (X3)
- R5. Morrison, Tony; Pathways to the Gods, New York, 1978, p. 141. (X1, X2)
- R6. Anonymous; "'Sunken Cities' of 1000 B.C.," Pursuit, 14:36, 1981. (X7)
- R7. Childress, David Hatcher; Lost Cities & Ancient Mysteries of South America, Stelle, 1986, p. 138. (X3, X4)
- R8. Sitchin, Zecharia; The Lost Realms, Santa Fe, 1990, p. 206. (X1-X5)
- R9. Bailey, Jim; Sailing to Paradise, New York, 1994, p. 64. (X6)
- R10. Hancock, Graham; Fingerprints of the Gods, New York, 1995, p. 87. (X5)

MSB6

Possible Neanderthal Structures

Description. The remains of crude structures apparently built from bones, stalactites, and other materials that have been dated as being much older than 35,000 years; that is, well before the widely accepted date when the Cro-Magnon people invaded Europe.

Data Evaluation. The subject structures and their dates have been briefly reported in Science News and Science. Additional details have not been found. Rating: 2.

Anomaly Evaluation. Assuming that the published dates are approximately correct, two interpretations are possible, both of which are at odds with current anthropological thinking.

(1) Neanderthals did build the structures and were therefore more advanced socially and technologically than generally supposed.

(2) Cro-Magnons arrived in Europe much earlier than scientific consensus allows, and they built the controversial structures.

Both possibilities are mildly anomalous. Rating: 2.

Possible Explanations. As discussed above.

Similar and Related Phenomena. Fossil evidence that Neanderthals and Cro-Magnons interbred.

Entries

X1. France. The public image of the Neanderthal is that of a brutish, hardly human creature clad in a ragged skin and unable to speak save for a few grunts. Now you can forget that picture.

In 1995, several hundred meters deep inside a cavern near Bruniquel, in southern France, spelunkers stumbled across a complex quadrilateral structure, 4 x 5 meters in extent, built up from chunks of stalactites and stalagmites. Within its "walls" they found a piece of burnt bear bone that was later carbon-dated as at least 47,600 years old. A burnt bone and a geometrical structure certainly suggest the work of an intelligent creature, as does the site's great distance from the surface. Torches would have been a necessity that far in.

That 47,600-year figure, though, presents a problem. The first Cro-Magnons (modern humans) did not filter into western Europe until about 35,000 years ago. According to the accepted anthropological schedule, only those "subhuman" Neanderthals inhabited that part of France in 47,600 BP.

The implication is that the Neanderthals knew well the sophisticated use of fire. They also had enough curiosity to venture deep into the earth, where for some unknown purpose, they piled together an enigmatic structure. All this also seems to require more information transfer than possible with a few "ughs"! (R2)

Of course, there is always the possibility that those mysterious Cro-Magnons, who seem to have appeared out of nowhere, got to western Europe ahead of schedule. They are probably the artists who made those 31,000-year-old cave paintings at Grotte Chauvet in southern France. Even though of sligh-ter build and possessing smaller brains, the Cro-Magnons are thought to have quickly replaced the Neanderthals.

Some skeletal evidence even suggests a limited amount of interbreeding between Neanderthals and Cro-Magnons. It is doubtful that this would have occurred if the Neanderthals were as brutish as claimed!

X2. Ukraine. The French Neanderthal structure described above was not the first such construction to challenge the anthropologists' assessments of the Neanderthals.

In 1965, R.G. Klein, a University of Chicago anthropologist, reported that at Molodova, in the Ukraine, there is a circle of mammoth bones encompassing an area 8 x 10 meters. Some 27,000 pieces of flint have also been collected at this site. Russian scientists speculate that these bones were once part of a semicircular building covered with animal skins.

Some 35,000 years ago the Cro-Magnons did build similar structures at Molodova, but the bones at the deeper levels reported by Klein, date back to 50,000-70,000 BP---long before conventional wisdom has the Cro-Magnons entering Europe. (R1)

As in X1, one must consider the possibility that the Cro-Magnons were ahead of the schedule set for them by the anthropologists.

References

- R1. Anonymous; "Past, Modern Man Linked," Science News Letter, 88: 359, 1965. (X2)
- R2. Balter, Michael; "Cave Structure Boosts Neanderthal Image," Science, 271:449, 1996. (X1)

MSB7

Puzzles of the Maltese Temples

Description. Features of the Maltese temples demonstrating the precocious engineering talents of the builders and, in addition, raise questions about where these people came from and why their culture disappeared so suddenly and completely.

Data Evaluation. The Maltese temples have been excavated and thoroughly explored by the archeological profession. Although our sources include two articles from science journals, our main references are popular archeology books. The first figure in the ratings below give our data evaluations.

Anomaly Evaluation. We identify here six remarkable features of the Maltese temples. The anomaly evaluations are the second figures in the ratings below.

- The lack of structural antecedents. The Maltese temple-builders seem to have appeared out of nowhere (X1). Ratings: 1/2.
- The infrastructure of the three small islands of Malta do not seem adequate to have supported an economy robust enough to construct such an immense complex of temples and related megalithic structures (X1). Ratings: 1/3.
- The Hypogeum displays a precocious recognition of sophisticated acoustical engineering principles (X2). Ratings: 1/3.
- The fire-reddened walls of some of the temples suggest either a natural disaster or social upheaval about which we can only surmise (X3). Ratings: 2/2.
- The existence of many stone spheres at one of the temples. Their purpose is obscure (X4). Ratings: 1/3.
- The notable dearth of astronomical alignments of the temples when compared to the preoccupation of subsequent cultures with astronomy. Why this sharp cultural disconnect (X5)? Ratings: 2/3.

Possible Explanations. The mainstream explanation asserts that the Maltese temple-builders were driven by some transcendental imperative and focussed all efforts toward this end, but there are only vague speculations concerning the origin and nature of the culture itself.

Similar and Related Phenomena. The precocious flowering of the Tiahuanacan culture in a rather isolated environment (MSB5); the acoustical engineering observed in some British megalithic structures (MSU3); the records of conflagrations at other ancient sites (see indexes in Series-M volumes); the Costa Rican stone spheres (MSO2 in Ancient Infrastructure); the exceedingly common astronomical alignment of structures in later cultures.

Entries

X1. Overview of the Maltese temples. Malta is an archipelago of three tiny islands located in the center of the Mediterranean between Sicily and Tunisia. The island of Malta is largest, but only 9 by 17 miles. Gozo is 4½ by 9 miles. Finally, only a square mile of

Comino rises above the Mediterranean. The point being made here is that Malta is geographically small. Nevertheless, we find on these tiny bits of land a magnificent array of large megalithic structures that could only have been raised by a large, industrious, socially

advanced culture.

How could such specks of real estate have supported a culture robust enough to raise such impressive, labor-intensive structures? This fact must be considered modestly anomalous.

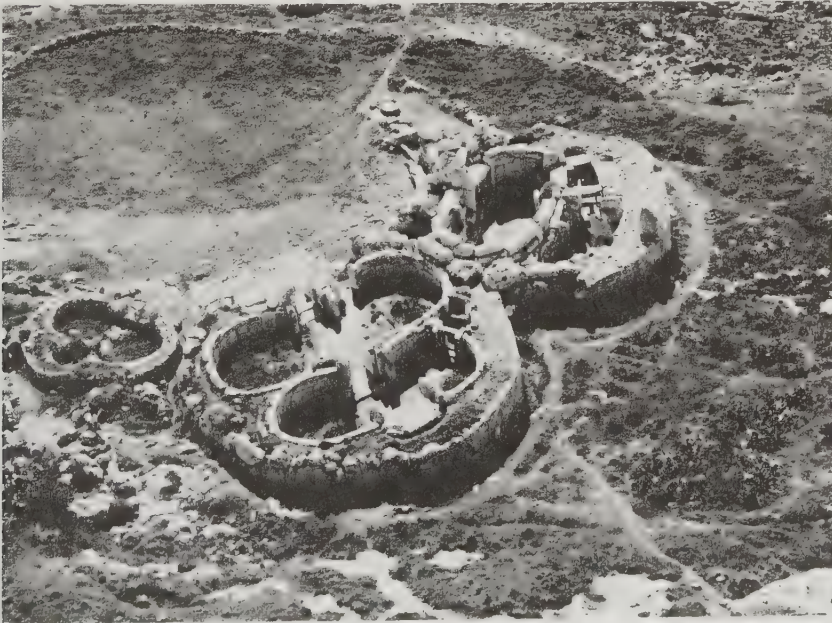
In addition, the Maltese temples are generally admitted to be the oldest free-standing structures on earth. They date back to 3,500 B.C., perhaps a bit earlier. They predate the Egyptian pyramids and Myceanea.

The people who built the temples have no known antecedents; they seem to have come out of nowhere. Their culture flowered for about 1,500 years on these minute islands and then vanished. The temple-builders left neither a written language nor enough artifacts to tell us who they were and why they expended such great labors in the pursuit of what was evidently some transcendental goal: a god or deities of some sort, we suppose. One temple on Malta and perhaps another on Gozo would seem to be enough to satisfy the normal human desire to commune with higher powers. But Malta is crammed with megalithic religious structures. How and why did the ancient Maltese build so profligately?

The mystification of archeologists and anthropologists over Malta's prehistory was expressed by T. Zammit, a renowned student of these islands.

The number of buildings is more bewildering than their magnificence. If the islands had only one or two complete megalithic structures one would feel that the Neolithic population had raised a monument to the Power they believed in, or in honor of a hero or for the hero's use, but when these complete dwellings, towers or temples, whatever they may be thought to be are met with all over the island the explanation of their presence is certainly perplexing. (R2)

As Zammit remarked, the main puzzles of Malta are not that the temples and other structures are impressive but rather that we do not understand the builders' purpose and why they expended such prodigious labor. Nor do we know how such small bits of terra firma could have been agriculturally productive enough to free enough workers to build all the temples and lesser religious structures.



The Mnajdra temples as seen from the air. (Malta Department of Information)

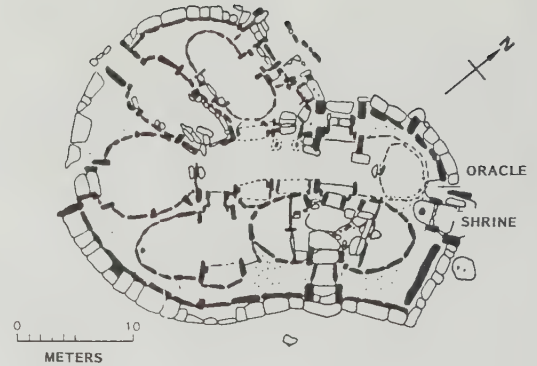
Of course, the temples themselves are remarkable and deserve the following brief description and accompanying illustrations.

In Malta's apparent overabundance of megalithic sites, the so-called temples receive most of the attention. The most prominent are those at Ggantija, Tarzien, Hagar Qim, and Mnajdra. (See illustrations.)

The temples are all constructed of limestone. They often occur in pairs for some unknown reason. In ground plan, the major temples are unusual in their lobed geometry; from a trefoil (Mnajdra-III) to six lobes (Tarzien-II). One can best get a feeling for these curious geometries from the photos and plans.

For a closer look at one of the temple sites and the dimensions of the structures, we quote from R. Furneaux.

The two enormous temples at Ggantija on the island of Gozo contain stone uprights 16 feet (4.8 metres) high. One is 26 feet long and 13 feet wide (about 8 by 4 metres) requiring a colossal engineering feat in transportation and erection. The temples are fronted



*Plan of the Hagar Qim temple.
(Adapted from R7)*

by a spacious terrace 40 feet (12 metres) wide, supported by a great retaining wall. Its imposing facade has been described as the earliest architectural concept existing in the world. Within lie broad courtyards with curved ends. A doorway leads to another trefoil-shaped court. No wonder the modern Maltese call one



The main facade of Hagar Qim.

temple the Tower of the Giants. It measures 100 feet (30 metres) in length and breadth, and its largest chamber is 35 feet long and 30 feet wide (10.5 by 9 metres). (R5)

It obviously took a people with a single, impelling, overriding purpose to construct these great structures. It is, however, below ground that we find that greater labors were expended and more mysteries extended.

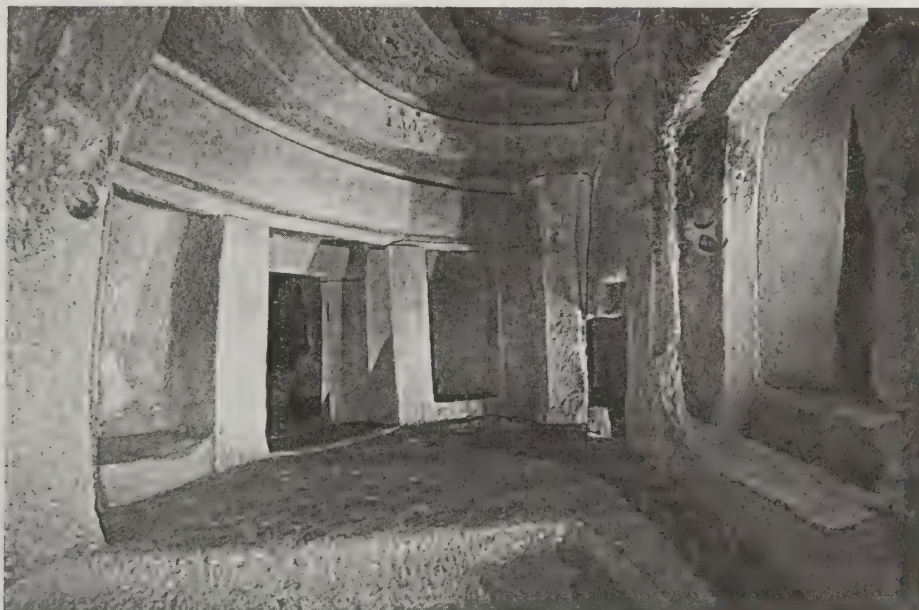
X2. The Hypogeum. One of the most remarkable productions of Malta's megalithic builders is not megalithic at all; that is, it was not constructed by assembling and erecting huge stones in the open air. This rather strange structure, called the Hypogeum, is located at Hal Saflieni near Valletta.

In Greek, Hypogeum = earth chamber. In actuality, the Hypogeum boasts more than twenty subterranean chambers lying about 30 feet below the present surface. These and interconnecting

passages were laboriously carved out of the solid rock more than 4,500 years ago. What a challenge to excavators armed only with stone wedges and antlers. Somehow, they chipped and gouged out a total area of about 1,600 square feet.

One minor curiosity of the Hypogeum is that its design reflects the arrangement of the above-ground structures at Hal Saflieni---in effect an underground replica of the world above. This above-and-below-ground mirroring certainly suggests life and death and associated rituals. Added to this is the discovery during the Hypogeum's excavation in the early 1900s of some 6,000-7,000 skeletons packed into selected rooms. The presumption is that a portion of the Hypogeum served the same function as the catacombs of Rome.

Of even greater interest is the acoustical-engineering talents of the ancient Maltese. Off to the side of one of the Hypogeum's chambers is the so-called "Oracle Room." A hole in the stone wall connects the oracle room with the chambers. It is thought that a priest occupied the oracle room during



The underground Hypogeum was carved out of solid rock. (Malta Department of Information)

rituals, speaking or chanting through the hole, his (or her) voice eerily modified by the carefully designed geometries of the chambers. A Time-Life book reconstructed what the scene might have looked and sounded like.

In this lightless temple deep underground, worshippers may once have huddled, surrounded perhaps by the bones of their own ancestors, while the voice of an unseen oracle resounded from chamber to chamber. Research has revealed that the Hypogeum is a superb echo chamber that will transmit any deep, low voice from one end of the vault to the other. The speaker has only to sit in a small niche off the so-called Oracle Room and talk, and the words rumble along a ridge cut into the rock below the ceiling and bounce eerily from wall to wall. (R12)

The ceiling ridge and the chamber dimensions imply that the designers of the Hypogeum were precociously cognizant of some acoustical principles. So were some of their distant cousins of the Megalithic Age. It is now acknowledged that some of the megalithic chambers and stone circles in Britain were purposely designed to impress congregations with their acoustical properties. (R15)

As always in such situations, we must ask if this was independent invention or the long-distance diffusion of knowledge. Given the earlier flowering of ancient Malta compared to the megalith-builders in Britain and Western Europe, the former seems more likely.

X3. Evidence of conflagration. The first excavators of the Maltese temples noted a potentially important anomaly; one that is rarely mentioned today. It appears that the interiors of the temples had---apparently---at some time in the past been reddened by fire. It is, of course, impossible now, several millennia later, for us to ascertain the cause and timing of the supposed fires. Since more than one temple was scorched, accidental conflagrations can probably be ruled out. A violent earthquake might have started simultaneous

fires, although we do not know whether the temples actually contained sufficient flammable materials. (R8)

More intriguing is the possibility that the fires were deliberately ignited, either during a social revolution among the islanders themselves or by invading forces from the mainland. Conflagrations seem to have attended the demises of several ancient cultures. The burning of Troy is well known, but there was also a firestorm at Mohenjo-daro, and the Long Ears on Easter Island all perished in the Poike Ditch. Since, like so many other cultures, the Maltese temple-builders disappeared from the record books suddenly, it is not impossible that they perished by fire.

X4. The mystery of the stone spheres. The three major structures at Tarxien were probably the last to be raised by the Maltese megalith-builders. It is here, in one of the temple chambers, that we find a rectangular stone block about 12-feet (3.5-meters) square. Holes were drilled in the flat surface, and nearby is a supply of more than a hundred stone spheres of various diameters. Was this some ancient pin-ball machine? Some prehistoric board game? Not likely, considering that 7,000 skeletons were found in the Hypogeum. The Maltese temples were built for more serious ends. A better guess is that the stone block-plus-spheres constituted an oracle of sorts. (R5) Like the "casting of runes," the rolling spheres were guided by the forces of destiny. The holes they settled in foretold the future! But this is just a guess.

When D.H. Childress visited Tarxien, he noted a set of large stone spheres inside the courtyard of one of the temples. His surmise was that these particular spheres had served as ball bearings for huge stone doors that once guarded the chamber's entrance. The doors themselves no longer exist. (R14) If there were grooves in the floor for the bearings to roll in, we have seen no mention of them.

We do not know if the spheres in the chamber are related to those Childress saw in the courtyard. Neither do we understand how a group of five holes drilled into a stone slab in the forecourt of Tarxien-I fit into the

picture. Were they a map of the Southern Cross as some have ventured? (R9, R10) This leads us to the subject of the possible astronomical alignments of the temples.

X5. Little interest in astronomy on ancient Malta. In 1981, G. Agius and F. Ventura reported in Archaeoastronomy the results of their survey of possible temple alignments.

From the foregoing [research], we conclude that the correlations with significant sun, moon and star positions provide us with only one plausible alignment: that at Mnajdra-I. This means that out of twenty-four temple axes only one seems to have been aligned with the sun. The other twenty-three axes show some alignments which are either improbable or which imply construction dates which do not correspond with the archaeologically determined ones. (R9, R10)

Agius and Ventura recognized that the good solar alignment at Mnajdra (equinox sunrises), even though precise, could have been fortuitous. The ancient Maltese did not seem to be entranced by astronomy like the somewhat later megalith-builders of Britain and Western Europe. This disconnect was probably due to Malta's geographical isolation in the Mediterranean and the culture's predating that of Britain and Western Europe. The Maltese temple-builders, it seems, did not look to the stars for cosmic insights but rather to subterranean oracles and--- just possibly---rolling stones!

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MSB8

Baalbek: The Tiahuanaco of the Old World

Description. The presence in the Terrace at Baalbek of three enormous stone blocks (the Trilithons) weighing over 600 tons each and a 1,100-ton block abandoned at the quarry (the Monolith). Exactly how the former were transported and set in place is not known, nor is the identify of the builders, nor the time of the Terrace construction.

Data Evaluation. The dimensions and weights of the Trilithons and the Monolith at Baalbek are well-established, as is the quarry from which they were extracted. We have found virtually nothing about the date of the construction of the Baalbek Terrace or its likely builders. Few clues exist suggesting exactly how the largest Terrace stones were transported and emplaced. Our literature search may be deficient here. Nevertheless, the Trilithons and the Monolith are certainly real enough, and we can make reasonable guesses at the engineering problems faced by the ancient engineers and the solutions they may have employed. Rating: 2.

Anomaly Evaluation. At least eight questions about Baalbek's Terrace need to be addressed.

- Who quarried, transported, and set the 610-ton Trilithons in place?
- When did they accomplish this feat?
- Why was the 1,100-ton Monolith fine-dressed at the quarry and then abandoned there still attached to the bedrock at a weird angle?
- How were the 610-ton Trilithons transported?
- If 10,000 or so people were required to drag them (as some calculate), where did they stand?
- Was a stone-paved road built for the transportation of the Trilithons to the Terrace? If so, what happened to it?
- How were the 610-ton Trilithons raised 26 feet and deposited on the lower courses of the Terrace's foundation?
- Why did the Terrace builders bother quarrying such large stone blocks when smaller ones would have sufficed?

Serious and fascinating though the above questions may be, they merely reflect our ignorance and do not place any important scientific paradigms at risk. The culture that built the Baalbek Terrace undoubtedly had thousands of workers at its disposal as well as considerable time and native ingenuity. Radical solutions, such as aliens with antigravity machines, are not required in our opinion. The anomalies here are in the details. Rating: 2.

Possible Explanations. See above discussion.

Similar and Related Phenomena. The transportation of large menhirs (MSD1 in *Ancient Infrastructure*; the transportation of the building stones at Ollantaytambo (MSB4-X2); the building of the Great Pyramid (MSP6).

Entries

X0. Introduction. The title of this section should be compared with that of MSB5. The reversal is eminently reasonable because both locations are distinguished by immense stone building blocks, as well as some similar anomalies worth cataloging, as itemized above in Anomaly Evaluations. Both Baalbek and Tiahuanaco, incidentally, have been characterized as "the oldest city in the world" in the popular literature! Obviously, both cannot be. This conflict may not be resolvable because while Tianhuanco's dates have been fairly well pinned down by the archeologists, Baalbek's early history and the identity of the builders of its gigantic megalithic Terrace get little professional attention in the literature we have surveyed.

Regardless of who built it, we have accumulated many precise, rather amazing statistics concerning Baalbek's great Terrace and the immense stones incorporated in it.

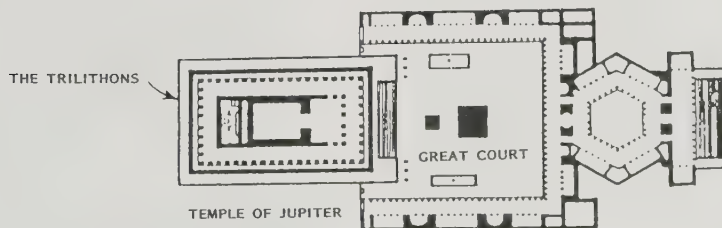
X1. General observations. Located about 50 miles northeast of Beirut, Baalbek is presently in Lebanon, although it once belonged to Syria and, before that, the Turkish Empire. Arab writings assert that the first temples were raised at Ballbek just after the Flood of Noah. King Nimrod is said to have enlisted a tribe of giants for the project. As we shall see, many, many giants would have been required.

The Romans conquered the region

around Baalbek in 63 B.C. Little is known about the builders of the structures the Romans found. The Phoenicians are often mentioned, but they did not have the capability of moving the huge stones in the great Baalbek Terrace. The practical Romans, though, did not hesitate to make good use of the ancient stone foundation prepared by that unidentified earlier culture. Upon these stones, they began building a temple dedicated to Jupiter. It was the most splendid and ambitious temple the Romans ever attempted. Work on the new temple began in 131 A.D., lasted 30 years, and stopped short of completion. The Roman remains, although they impress modern tourists, are not nearly as remarkable as the ancient Terrace upon which they rest.

It is this Terrace or platform that captures the attention of anomalists and even the most blase archeologists. Back in 1914, L.B. Paton was duly impressed by what he saw beneath the much smaller stones of the unfinished Roman temple.

The lowest course of the outer retaining wall consisted of moderate-sized stones. Above these came three courses of stones, each about thirteen feet in length. The middle courses remain only on the western side, and there consist of three of the largest stones ever used by builders. One is sixty-four feet long, another sixty-three feet and one-half, and the third sixty-two and one-half. All are about thirteen feet high and ten feet thick. The inner surface of one of these stones has



Plan of the Roman Temple of Jupiter at Baalbek. It was built upon an ancient foundation containing the 600-ton Trilithons.



This side of Baalbek's Temple of Jupiter contains the famous Trilithons, each of which weighs about 600 tons.

been exposed by the excavations on the west side of the Temple Court. From these remarkable stones the temple probably received its ancient designation of Trilithon. A similar stone, seventy by fourteen by thirteen feet and weighing at least one thousand tons remains in the quarry from which the other stones were obtained. How these gigantic blocks were transported and raised to a height of twenty-six feet in order to rest upon the lower courses, is an unsolved problem. (R2)

The stone remaining in the quarry is now called the "Monolith." H.J. Shepstone elaborated on this singular block of stone in his 1913 article in Scientific American.

They [the Trilithons] are the largest building blocks ever known to have been used by man, and a still larger one [the Monolith] lies in the ancient near-by quarry, never having been detached from the rock beneath. This one is 70 feet long, 14 feet high, and 13 feet wide. Its estimated weight is 1,100 tons, and it is calculated that to raise it would require the strength of 60,000 men. (R1)

It is interesting to compare the big Baalbek stones with the largest at other sites likewise notable for the use of large building stones.

Baalbek Monolith	1,100 tons
Baalbek Trilithon	620
Great Pyramid	200



The famed Monolith in the quarry at Baalbek. Although mostly dressed, it is still attached to bedrock on the bottom. Weight: about 1,100 tons. (Kadath)

Tiahuanaco	130
Stonehenge	50

Without question Baalbek wins the weight contest. The Baalbek stones are beyond the lifting capacity of today's ordinary construction cranes. The only pieces of modern machinery that come close to being able to handle Baalbek stones are the great tracked vehicle used to transport the Saturn-V rocket to its launch pad and some massive fixed cranes used in dam-building.

Although our focus must remain on the Monolith and Trilithons, the Baalbek Terrace is itself an impressive engineering accomplishment. It is a broad assemblage of precisely fit stones extending for almost a half-mile. The Terrace covers an area of more than 5 million square feet and is one of the largest man-made structures in the world. Its volume of stone rivals that in the Great Pyramid!

X2. Questions raised by the Trilithons. At Tiahuanaco (MSB5), we wondered how the 130-ton stones were transported some 5-10 miles and then maneuvered into place---all accomplished at

12,000-plus feet of altitude. The Baalbek stonemasons, at only 3,500 feet altitude and a mere three-quarters of a mile from their limestone quarry would seem to have had an easier transportation task. Not so! Stones weighing 600 tons are very reluctant to move either horizontally or vertically.

We will begin at the quarry, where the 1,100-ton Monolith resides cocked at a weird angle and still attached to the bedrock. Curiously, it has sharp edges and smooth faces. Usually, such stones are only rough-dressed at the quarry and finished at the building site. Perhaps, the Monolith was never intended to be moved. Or, maybe the Baalbek workmen had so many problems moving the 600-ton Trilithons that they abandoned plans to move the Monolith. So, they fine-dressed it and left it as a monument to their ambitions!

The Trilithons were detached from bedrock and moved. That much is certain. But how were they moved; by sledges or on wooden rollers? Probably the latter, since a sledge of the required size would be monstrous, and its runners would be crushed by the Trilithons' weights. A layer of large-diameter logs seems more reasonable from an engineering standpoint. Even with scores of logs beneath a Trilithon,

crushing might have occurred. But we do not know enough about the situation to make any calculations on this point.

Assuming log rollers, the first problem involves getting the logs under the Trilithons. This could have been done by simply excavating a cavity under the Trilithons while they were still attached to the bedrock, inserting the logs, and then freeing the Trilithons from the bedrock.

It should be obvious that the logs, perhaps nearly crushed by the 610-ton load, would not have rolled on sand or any other soft surface. A stone roadway, like the one the Egyptians used at one of their quarries would have been essential. (See MSR1-X6 in Ancient Infrastructure.) This postulated roadway, 3/4-mile long, would have been an ambitious engineering job by itself. One would expect to see some traces of it remaining even today. But there is no hint that it ever existed. Its supposed stones were probably expropriated for construction work elsewhere.

Next, assuming rollers and a paved roadway, how many people would have to man the ropes to drag the Trilithons 3/4 mile? Based upon experiments with rollers and Stonehenge-sized stones, figures of from 9,700 to 16,000 men would have had to strain away---providing they could have found a place to stand. (R4, R5)

This all sounds a bit ridiculous to us today, but it was not impossible in ancient times; and we do know that something like it was done. Modern humans have little appreciation for earlier cultures, their patience, the numbers of workers available, and the time at their disposal. Ancient Egyptian artists painted pictures of huge gangs of men hauling immense monolithic statues. (MSD1 in Ancient Infrastructure) We not not postulate aliens and antigravity machines, as is too often

done in popular books.

The real problem may have occurred at the Terrace itself. How does one lift and position 610 tons? Again, we can only guess: levers of metal bars, stone-paved ramps? The Baalbek problems are like those encountered by the builders of the Great Pyramid, except that the Baalbek Trilithons are thrice the weight of the largest pyramid stones. At Baalbek, we guess that the big stones were pulled up stone-paved ramps and then dragged and levered into position.

One can also ask a philosophical question about the 610-ton Trilithons: Why bother with such large stones? Smaller ones would have sufficed, as they have elsewhere all over the world. The answer is probably the same as it is for the Empire State Building, the Sears Tower.

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MSB9 Miscellaneous Ancient Structures: Asia

Description. Unusual, apparently very ancient, stone and wooden buildings, some of the former precociously incorporating iron beams.

Data Evaluation. Our collection of reports of enigmatic Asian buildings and sundry structures is very limited. Our sources are deemed very reliable, but hardly forthcoming in the matter of details and scope. There can be no doubt that foreign-language journals could add much to this section. China and Southeast Asia, for example, are not represented at all.

Our specific data evaluations are the first figures given in the ratings below.

Anomaly Evaluation. The four structures cataloged in this section are listed below. Our anomaly evaluations are the second figures in the ratings.

- The precocious use of iron beams in building construction in India (X1).
Ratings: 1/2.
- Precision-fit stone masonry in the Maldives that is similar to that seen on Easter Island and in South America (X2). Ratings: 1/2.
- A large wooden building of great age in northern Japan (X3). Ratings: 1/2.
- Hundreds of rather large stone buildings throughout Japan of unestablished age, purpose, and provenance (X3). Ratings: 2/3.

Similar and Related Phenomena. Inca stone masonry (MSB4); woodhenges (MSH23 in Ancient Infrastructure); the transoceanic distribution of precision-fit stone walls (MSW3 in Ancient Infrastructure).

Entries

X1. India. Iron-working had an early start in India, probably as early as 300 A.D. The most famous example of this precocious metal technology is the Delhi Pillar. (MSO6-X1 in Ancient Infrastructure) Even more impressive, though, from an engineer's perspective, are 29 massive iron beams up to 35 feet long at Kanarak. (R3) Iron beams of this size predated European iron-forging capabilities by centuries. It is necessary to emphasize, however, that the Indian metal-workers did not forge their remarkable beams in one piece, as is done routinely today. Instead, they hammered together small, heated discs of iron in a process called "forge welding." Nevertheless, an iron beam 35 feet long represents an amazing feat for the first millennium A.D.

Indian iron-working is of interest in this chapter because the Kanarak iron beams were designed as structural components of a building---specifically the

famous Black Pagoda. Very likely this was the first use of iron beams for such a purpose anywhere in the world.

The following note describing this early use of iron beams appeared in the October 3, 1912, issue of Nature.

At the Black Pagoda of Orissa, Kanarak, there are some very large forged iron beams; the two largest members, as described by Mr. H.G. Graves, of Calcutta, are 35 ft. long by 8 in. square, and 25.5 ft. long by 11 in. square. The broken end of one of them indicates that the method of construction was by the welding up of billets. The age of the temple has been placed by some as early as the ninth, and by others as late as the Thirteenth Century. Examination indicates that the small blooms [hot billets] were of 3 to 4 lb. in weight; in some places the billets appear to have been welded

together in strings to form short bars, which in turn were welded into place. (R2)

Note the wide range of construction dates!

X2. *The Maldives.* This low-lying group of almost 2,000 islands is located southwest of the Indian subcontinent. In the distant past (no one seems to know how distant), the Maldives were an important crossroads for ship traffic in the Indian Ocean. According to Maldivian legends, the islands were then occupied by a tall, white-skinned race called the Redin. This culture had erected many statues, stone buildings, and even a pyramid of sorts. (MSP1) When Islam conquered the Maldives in 1,153 A.D., the artifacts left behind by the Redin were systematically destroyed. Research into this vanished culture was repressed. Consequently, today very little is known concerning this shadowy race of people, assuming they existed at all.

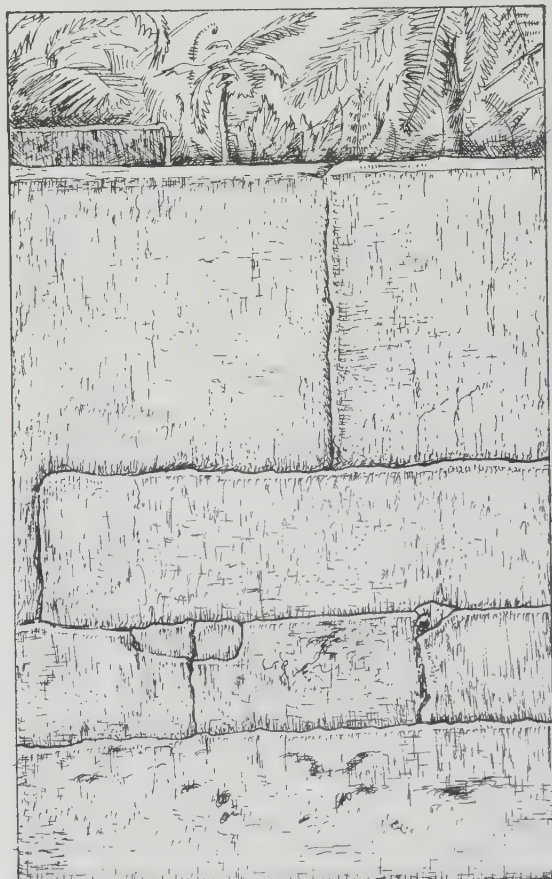
In the 1980s, explorer T. Heyerdahl was invited to the Maldives to try and learn more about the distant past of the islands. Besides finding sundry mounds, statuary, and the aforementioned pyramid hidden in the dense jungle, he observed that present-day mosques were often not oriented toward Mecca, as customary. The reason was not hard to find; many mosques had been erected upon the stone foundations remaining from pre-Islamic cultures. The Moslems had appropriated the ready-made foundations for their own use, even though they were not properly aligned. The early Christians did the same sort of thing when they built their churches on European pagan megalithic sites.

While exploring the mosque at the village of Kedeere, Heyerdahl had the opportunity to study the pre-Islamic foundations beneath the mosque. He found remarkable stone masonry---presumably the work of the Redin. His description follows:

The megalithic stairway descended the east wall, and was broad enough for a man to stretch out across. The stones used were truly large, even though they were cut as straight and smooth as a panel of glass. We

measured one that was 2.45 meters (just over 8 feet) long, 63 cm (just over 2 feet) wide, and polished to an even thickness of 10 centimeters (4 inches). For hard limestone from the island bedrock to be cut with such precision made us marvel. Although fitted so closely that a knife-blade could not enter between them, these blocks were all of different sizes and not always rectangular. Many had one of more corners stepped in as shoulders and yet matching their neighbors as closely as the pieces in a jigsaw puzzle. (R4)

Heyerdahl added that such stone masonry was unknown in Europe and,



Large precision-fit stones in a pre-Islamic foundation at the village of Kedeere, in the Maldivian Islands. (R4)

indeed, most of the rest of the world. It was the "fingerprint," he asserted, of an ancient far-flung culture. As we might expect from his well-known belief in transoceanic cultural diffusion, Heyerdahl related the Maldivian masonry to that seen on Easter Island and along the western coast of South America. As for the mysterious Redin, he wondered whether they might have been related to the equally enigmatic Long Ears of Easter Island and possibly other white races rumored to have once existed in Oceania and around the Pacific Rim.

X3. Japan. This island nation, like Britain, is home to a broad spectrum of puzzling buildings dating from megalithic times and even earlier. There are even diminutive Japanese pyramids. (MSP1-X6) These intriguing Japanese archeological sites are scarcely known in the West.

In our rambles through the literature, we have come across two Japanese sites of more than usual interest. (Doubtless there are many others not mentioned in the English-language journals that we depend upon.) The first site, at Aomori, 375 miles north of Tokyo, is well-known in Japan and a popular Japanese tourist destination. The second, site, near Okayama, seems to be representative of a class of poorly known prehistoric structures widespread throughout the Japanese islands.

Aomori. At Aomori on Mutsu Bay, in northern Japan, archeologists have filled more than 40,000 boxes with artifacts left by the Jomon people. The Jomon culture extended over much of Japan in the period from 10,000 B.C. to 300 B.C. Although the Jomon people are usually considered to have been simple hunter-gatherers, the Aomori site demonstrates that they were much more sophisticated. They dabbled in agriculture (chestnuts, millet), traded for jade with southern Japan (400 miles away) and obtained obsidian from Hokkaido to the north across the Tsugaru Strait.

The most startling find at Aomori is a group of six enormous holes in the ground containing the remains of heavy wooden pillars about a meter in diameter. Apparently, some massive wooden structure once existed at this site. The

Jomon, it now appears, were more advanced socially and technologically than previously believed. (R5)

The finds at Aomori have been stunning to not only the archeologists but also the Japanese people in general, for the latter take great pride in their Jomon heritage.

Complicating this picture is the fact that analysis of Jomon skeletons suggest that the Jomon did not closely resemble most modern Japanese.

Instead, they had features that made them look more like Caucasians and they seem to have resembled the Ainu, an ethnic group that still lives in tiny numbers in northern Japan. In the museum here in Aomori, Japanese tourists wandered by exhibits about the Jomon and gazed affectionately at pictures of what their Jomon ancestors are believed to have looked like---even though the only one in the room who looked much like the pictures was an American. (R6)

Could the Jomon have been related to the Redin of the Maldives and the Long Ears on Easter Island? Heyerdahl would probably warm to this suggestion!

Okayama. G.F. Wright, a turn-of-the-century American who seems to have been interested in all facets of Nature and anthropology in particular, visited Japan in 1900, and filed the following words with Science.

While in Okayama, Japan, in the early part of this month [April] I was conducted by Rev. J.H. Pettee to the hills about two miles east of the city to see some prehistoric stone structures which he had noticed in his rambles. The first one to which we came was situated about 500 feet above the valley (which was nearly at sea level) near the summit of a steep declivity overlooking an extensive country. This was built of stones laid up in regular courses, some of them very large. One stone was 5x5x4½ feet. Large flat stones served for the roof. The entrance was twenty-one feet long, six feet wide, and about twelve feet high. This opened into a room twelve feet long, of which the north side was flush with one of the walls of the entrance, making the entire length

of this wall thirty-three feet. The room is twelve feet square, and about the same height. The whole was covered with a mound of earth, upon which trees of considerable size were growing. This one had been cleaned out and put to some modern use.

.....

The universality of such indications of a primitive culture preceding that of existing civilizations in Japan as well as in Europe and America is certainly interesting and significant. (R1)

Wright added that hundreds of such stone structures are found throughout Japan. His latter paragraph is, of course, presumptuous. In 1900, no one could accurately date such structures.

We have found nothing on how today's Japanese archeologists view these stone buildings. Are they dwellings, burial chambers, shrines, a variety of dolmen? How old are they? We do not know. They may not be

anomalous at all, but the structure described in the quotation is of substantial size and is constructed from large, well-ordered stones. It is something we want to learn more about.

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MSB10

Miscellaneous Ancient Structures: Oceania

Description. Throughout the Polynesian Triangle, the presence of hundreds of stone structures of modest size, but some utilizing very large stones, precision-fit stones, and/or stepped-pyramid architecture.

Data Evaluation. Our major source is P. Bellwood's Man's Conquest of the Pacific (R3), as supplemented by several popular books, particularly the photographs in the latter. The data evaluations for the specific anomalies and curiosities are the first figures in the ratings below.

Anomaly Evaluation. As customary in these volumes, structure size and the use of very large stones are not considered highly anomalous, even in Oceania where the existence of megalithic architecture is not widely recognized. By far the most anomalous claims associated with Polynesian structures are those suggesting trans-Pacific cultural diffusion, such as the use of precision-fit stone masonry and

stepped-pyramid architecture. At best, evidence is slim for such ocean-wide cultural diffusion.

Our anomaly evaluations are the second figures in the ratings below in the listing of potentially anomalous features of Polynesian architecture.

- Extensive, ambitious, almost fanatical proliferation of ritual structures (mostly marae) on some islands (X1, X5). Ratings: 1/3.
- The use of immense stones in a few structures (X1, X3). Ratings: 1/3.
- A few examples of megalithic walls incorporating precision-fit stones resembling Inca-style stone masonry (X1, X4). Cultural diffusion is implied. Ratings: 3/1.
- The existence of large marae with multiple tiers resembling the stepped pyramids found in Asia and South America (X2). Again, cultural diffusion is implied. Ratings: 3/1.
- The presence on remote, virtually uninhabitable islets of a profusion of archeological sites, including many marae (X5). Ratings: 1/3.

Possible Explanations. The ancient Polynesians were adventuresome, inventive, and highly religious.

Similar and Related Phenomena. Precision-fit stonework (MSB4, MSB9, and, in Ancient Infrastructure, MSW3); other remote sites thought to be dedicated to rituals, such as Chaco Canyon (MSR2), Watson Brake (MSM7-X2), and Callanish (MSH3-X1), all in Ancient Infrastructure.

Entries

X0. Introduction. The multitudinous islands dotting the wide Pacific support neither great pyramids like those at Giza nor megalithic temples such as may be seen on Malta. But there is a class of smaller structures of more than passing interest. The simplest members of this class are merely stone and rubble platforms, such as the "ahu" on Easter Island. Elsewhere in Polynesia, smaller layers are added to the foundation platform, creating severely truncated, stepped pyramids. As many as eleven steps were seen on one such structure on Tahiti, but we cannot compare these "marae," as they are generally called, to the pyramids of Egypt and Central America in size, age, and sophistication. Nevertheless, they fascinate us in their remoteness and idyllic settings. They also pose a few enigmas for us to ponder as we contemplate the immense oceanic tableau of the Polynesian Triangle, apexed by New Zealand, Hawaii, and Easter Island.

The Polynesian structures of most interest of stone-faced platforms called "marae", but the appellation "langi" is

also used, as are other words. On Easter Island, as just mentioned, the marae are called "ahu."

Marae are numerous and ubiquitous throughout Polynesia. Some are very large and represent much investment of social capital. Others are suggestive of cultural diffusion from Asia and South America. Some marae are found on remote, rather mysterious isles. There is much to catalog here. A few of the more interesting structures are described below.

First, an important cross reference. Another class of catalogable structures found in Oceania was created by piling up huge basalt prisms as if they were Lincoln Logs. Such structures are confined to Micronesia, notably the "city" of Nan Madol, on Pohnpei. Given Nan Madol's complexity and extent, we classify it and similar structural groupings with the "complexes" in Chapter MSS.

X1. Easter Island. No island in Polynesia is more mysterious than Easter Island. Nowhere else do we find such an impressive array of platform structures or ahu as we do on this easternmost corner of the Polynesian Triangle. It is upon these ahu that the island's renowned statues were erected, later toppled, and then re-erected for tourists to admire.

The magnitude of the ahu-building enterprise was well-described---perhaps over-described---by J.M. Brown in his classic 1924 book, The Riddle of the Pacific.

One has only to ride round the bold coasts and see the great burial platforms stretch in an almost unbroken line around the three dozen miles of its circumference to realize that it is not this mortuary speck in the greatest of oceans that is overshadowed by the imaginary parallel. Every mile or even half-mile, especially along the south coast and the east coast, you stumble across one of these great memorials of the forgotten great; and in some sheltered nooks, like Anakena Bay or La Perouse Bay, from half a dozen to a dozen are crowded together in a space no larger than Westminster Abbey and its precincts. Some of them are incoherent, almost shapeless, heaps of the myriads of millions of stones that cover the surface of the island; but these are a small minority. Into some of the largest must have gone the labour of tens of thousands of men for many years. It is not merely the piecing together of the large and small stones into platforms, some of which are four to five hundred feet long; that would, indeed, take vast masses of organized labour. It is the individual labour expended; there are in many of the platforms scores of immense stones ranging in weight from two to twenty tons, all shaped and tooled, each one of which would have taken a workman with his stone implements, aided by sand and water, years to cut and groove; they are most of them of a vesicular basalt that European masons would find it hard to work even with tools toughened by admixture of the rare metals. There must be tens of thousands of these adamantine and titanic stones all worked

into shape on the coasts of the island. And there must be hundreds of thousands of tons of such cyclopean blocks chipped into the requisite form, though untooled. A building like Westminster Abbey would not need a tenth part of the labour in tooling and handling and erecting that these hundreds of platforms took. No one can realize the amount of human muscle and the concentration of it that would be needed to fit out this islet as a place of sepulture till he has slowly ridden around all the coasts, and that is a task of days. (R1)

While impressed by Brown's enthusiasm for the energy and dedication of the ahu-builders, we must emphasize that the ahu are simple structures from the engineering point of view---labor-intensive, but unsophisticated.

An oft-claimed exception to this generalization is the ahu at Vinapu, which is faced along one side with precision-fit stones. This wall superficially resembles the elegant stonework of the Inca in Peru. Indeed, T. Heyerdahl argues that the Vinapu stonework is strong evidence of an early, pre-European, South American presence on Easter Island. H.D. Skinner, however, demurs. The unusual Vinapu stonework, he asserts is only a veneer. Its stones are not tongued far back into the wall, as is the rule in the best Incan earthquake-resistant masonry. In his view, South American contacts need not be invoked to explain Vinapu. (R2) (See MSW3 in Ancient Infrastructure for a sketch of the Vinapu masonry.)

It is also pertinent that none of the other 300-or-so ahu on Easter Island displays this sort of sophisticated stonework. P. Bellwood provides us with a sober description of the typical ahu.

The ahu associated with the stone statues generally comprise a rectangular platform which abuts on its landward side on a sloping ramp, which in turn leads to a cleared but usually unwallled rectangular court. The ramps often extend for a long distance on either side of the central platform to form wings. The largest of the ahu, the now-destroyed ahu Tangariki, had a central platform about 45 metres long,

and a total length, with the two wings, of about 160 metres. The central platform supported 15 massive statues, all prostrate (except for one base) by about 1860, which seems to have been the latest date when any might have been left standing anywhere on the island. (R3)

Despite the many doubters, the sophistication of the Vinapu ahu, when coupled to the fact that the Easter Islanders were cultivating South American sweet potatoes when the first Europeans arrived, makes one suspect that there really might be something to Heyerdahl's diffusionist thesis.

X2. Tahiti. The greatest of all the Polynesian stone structures was marae Mahaiatea built on Tahiti in the mid-1700s by the chieftainess Parea. The platform forming the base measured 22 by 81 meters. With eleven steps, each about 1.2 meters high, this marae reached a height of over 13 meters. In overall appearance it was a stepped pyramid with a broad, flat top. The courses creating the steps were coral blocks. These were faced with squared volcanic stones. Marae Mahaiatea is largely destroyed now, but it was without doubt the most spectacular marae ever seen in Polynesia.

Should we compare the marae of Oceania to the stepped pyramids of the Americas and Asia and then invoke cultural diffusion? This would be unwise because stepped pyramids are too simple



Tahiti's marae Mahaiatea was over 40 feet high in the 1700s. It was constructed from coral blocks faced with dressed volcanic stones. It was probably the largest stone structure in ancient Polynesia. It has been mostly destroyed. (1799 sketch from R3)

a geometry. Children playing with blocks often make them without coaching. Stepped pyramids are a natural human predilection. But this sort of cursory analysis cannot ever completely rule out the possibility of the ancient trans-Pacific diffusion of ideas.

X3. The Marquesas. The construction of large stone structures was typical of the Polynesian culture present on the Marquesas in the 1700s. Dwellings were supported by stone-faced platforms called "paepae." There were also "me'ae", which were the Marquesan equivalent of the marae. In addition, various buildings were united in complexes called "tohua." Worth mentioning here for its large size is a tohua in the Taipiva Valley on the island of Nuku Hiva. It was built on an artificial terrace excavated on a hillside. The dimensions of this terrace are impressive: approximately 80 by 580 feet. The terrace was faced by a wall almost 10 feet high consisting of enormous stones. Judging from photographs, some of the stones in this wall measured 5 feet high and just as broad. This wall could well be designated "megalithic" even though

it is only 200-300 years old. (R2, R5, R7)

X4. Tonga. At the western edge of Polynesia, almost 2,500 miles from the Marquesas, lie the islands of Tonga. Here, we also find stones of megalithic proportions. At the ceremonial center of Mu'a, on the island of Tongatapu, a stepped platform called the Paepae-o-Telea. Some stones in this structure are about 4 feet thick. The tongue-tieing Paepae-o-Telea is believed to have been built in the Sixteenth Century. (R3)

The Tonganese equivalent of the marae is the "langi." The langi Taohala contains one stone block about 7 feet high that probably weighs 100-150 tons. This may be the largest structural stone in all of Polynesia. D.H. Childress notes further that this stone is notched and fitted into an adjacent block, just like some of the masonry on Easter Island, the Maldives, and at many South American sites. (R5, R6) The implication, of course, is that cultural diffusion transpired all the way from the Maldives, across the Pacific, to South America---a pan-Pacific culture! Such grandiose dif-



The ancient langi Taohala on Tonga incorporates a stone block 7 feet high weighing 100-150 tons. This is probably the largest structural stone ever used by the Polynesians. (R5)

fusion is unthinkable in mainstream archeology and anthropology.

X5. Two "mystery" islands. The Pacific is speckled with thousands of tiny islands, some of which, like Pitcairn, are remote and rarely visited. Many of these were deserted when first "discovered" by Europeans, but signs of previous human occupation were obvious. One can still see platforms, marae, and even stone roads on some of these tiny specks of land. We select two of these isles noted for their remoteness and the presence of so many ritual structures that one suspects they were designated for ceremonial purposes rather than permanent habitation.

Malden Island. Malden is one of the Line Islands, which are located east of Samoa practically on the Equator. D.H. Childress' description of Malden Island certainly suggests that it was a ceremonial center of some sort.

Malden Island is so remote, very few people have actually ever been there, yet, photos and scientific records do exist. The facts seem to be that there are indeed a number of temples on the island, and forty might well be the number. What [J.M.] Brown calls "truncated pyramids" appear to be more like platforms or temples. They are indeed made of cut stone blocks of large size, megaliths if you will. Dolmens, or other stones similar to "compass stones" adorn the tops of many platforms, while others are flat.

Especially intriguing are the so-called roads that disappear into the ocean. These also exist, but it is actually a bit much to call them roads. Brown called them "paved ways," which would be more accurate. They do indeed disappear into the ocean. (R7)

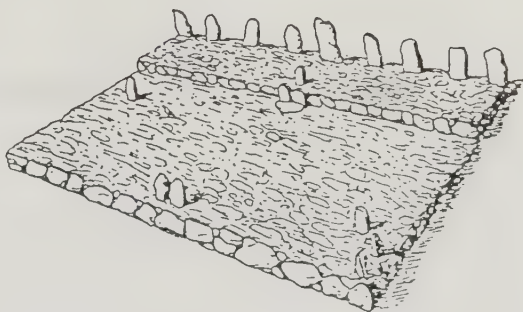
The Malden Island "temples" are basically the same as the marae found in various forms throughout Polynesia.

Necker Island. Two little known islands in the Hawaiian chain are Nihoa and Necker, located 250 and 500 kilometers, respectively, west of Kauai. They are

each only about a kilometer long, with little potable water and arable land. Yet, both are replete with an abundance of marae and platforms.

Necker is the more isolated of the two. P.V. Kirch remarked that while Nihoa might have supported a small, struggling population, Necker was probably never permanently occupied. It has only two small seeps of fresh water, and these are fouled by guano. Despite its remoteness, tiny size, and inhospitable character, Necker Island boasts no less than 60 archeological sites, including 34 marae. Kirch wrote further:

The thirty-four Necker marae are amazingly consistent in plan and architectural style and, as shown in [the figure], consist basically of a low, narrow, rectangular platform adjoining a paved rectangular court or terrace. Arrayed along the platform are a series of upright stone slabs, while other slabs are positioned at certain points in the court. (R4)



Necker Island, in the Hawaiian chain, is only a kilometer long, but it boasts 34 marae like the one sketched above. This one is about 25 feet wide. (R4)

Necker Island is, therefore, reminiscent of other remote sites dedicated to ritual rather than habitation. Callanish, Chaco Canyon, and Watson Break come to mind here. In fact, one might venture that the Polynesian marae are the equivalents of the British stone circles, and that similar ceremonies were conducted therein, even though the circles

and marae are separated in time by several millennia.

But did worshippers at Necker sail the 500 kilometers from Kauai just for ceremonies? Perhaps Necker Island was more of a religious retreat or a place for vision quests. The real purpose of Necker Island remains puzzling.

References

- R1. Brown, John Macmillan; The Riddle of the Pacific, London, 1924, p. 4. Reprinted: Kempton, 1996. (X1)
 R2. Skinner, H.D.; "Easter Island Masonry," Polynesian Society, Jour-

- nal, 64:292, 1955. (X1)
 R3. Bellwood, Peter; Man's Conquest of the Pacific, New York, 1979, pp. 313, 332, 339, 343, 355, 365. (X1-X5)
 R4. Kirch, P.V.; Feathered Gods and Fishhooks, 1985, p. 89. (X5)
 R5. Childress, David Hatcher; Lost Cities of Ancient Lemuria & the Pacific, Stelle, 1988, pp. 188, 279. (X3, X4)
 R6. Childress, David Hatcher; Ancient Tonga & the Lost City of Mu'a, Stelle, 1996, pp. 107. (X5)
 R7. Childress, David Hatcher; Ancient Micronesia & the Lost City of Nan Madol, Kempton, 1998, pp. 82, 185. (X3, X5)

MSB11 Miscellaneous Ancient Structures: Africa

Description. In Egypt, the presence of three structures with unusual configurations, built of enormous stone blocks, and of controverted ages. The specific structures are: the Fayoum Labyrinth, the Valley Temple at Giza, and the so-called Osireion at Abydos.

Data Evaluation. Our sources are all popular books, three of which are by authors espousing theories far from the scientific mainstream. Nevertheless, the basic descriptions of the subject structures are solid enough and are often backed by photographs. Our data evaluations are the first figures in the ratings below.

Anomaly Evaluation. The three structures identified above yield three possible anomalies. Our anomaly evaluations are the second figures in the ratings below.

- The use of extremely large building stones---often larger than those employed in the Great Pyramid. Again, it is uncertain how such immense stones were transported and handled (X1-X3). Rating: 1/3.
- The use of huge, interlocking, precision-fit stones resembling Incan stonework and the stonework seen on Easter Island, the Maldives, etc. Again, the diffusion question (X2). Ratings: 1/3.
- The obscure purpose of that very strange structure called the Osireion (X3). Ratings: 2/2.

Possible Explanation. The Valley Temple and Osireion (to say nothing of the Sphinx) were the products of a pre-pharaoh, "Osirian" culture. Needless to say, this theory is rejected out-of-hand by most noted Egyptologists.

Similar and Related Phenomena. Megalithic, precision-fit stone masonry (MSB4, MSB9, MSB10, and, lastly, MSW3 in Ancient Infrastructure); the use of exceptionally large building stones (MSB4, MSB5, MSB8); mazes and labyrinths (MSH5 in Ancient Infrastructure).

Entries

X0. Introduction. Africa's greatest enigmatic structures are without question the pyramids. Of course, Egypt is also home to many other ancient monumental structures, such as those at Karnak and Luxor. But, while the pyramids, especially the Great Pyramid, are sufficiently mysterious to earn space in this Catalog of Anomalies (Chapter MSP), most of the other structures raised by the pharaohs are not. Grand and beautiful though they may be, they do not really challenge prevailing archeological paradigms. We have, however, found three exceptions and suspect that there are more we do not yet know about. These exceptions are: the Fayoum Labyrinth (X1); the strange Osireion at Abydos (X3); and the Valley Temple adjacent to the Sphinx. (X2) At all three locations, questions arise concerning age, method of construction, and, above all, purpose.

In all the rest of Africa, we see no other miscellaneous enigmatic structures. We have covered the multitudinous megalithic remains sprinkled across northern Africa in our companion volume Ancient Infrastructure. As for the vast sub-Saharan region, the great ruins at places such as Zimbabwe and Dhlo-Dhlo are consigned to Chapter MSS along with other similar "complexes."

X1. The Labyrinth in the Fayoum. The Fayoum (Faiyum) is a 670-square-mile basin southwest of Cairo. This geological depression was the site of ancient Lake Moeris and was also the place where Pharaoh Amenemhet III had his subjects construct a truly remarkable building called "The Labyrinth."

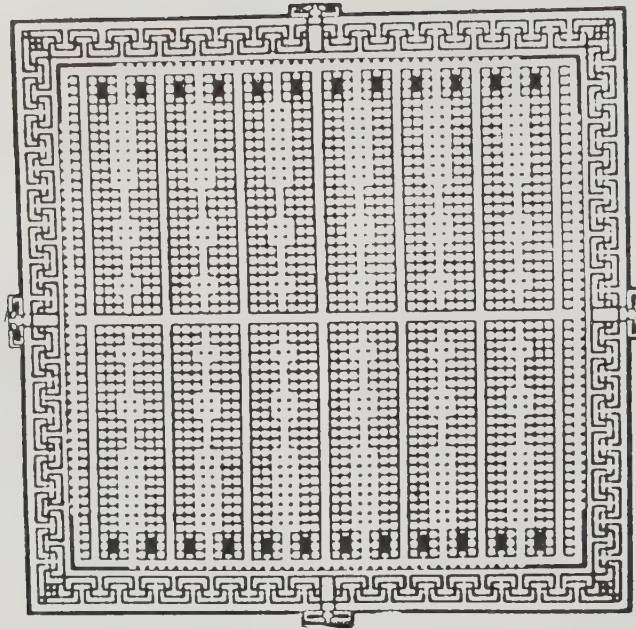
Finished about 2,000 B.C., The Labyrinth is indeed a complex structure with 3,000 rooms and many passageways,

but it is not intentionally confusing like a true labyrinth or maze. Rather, its floor plan is highly organized although manifestly intricate. One could easily get lost in it just as one gets disoriented in one of those monstrous modern parking garages. Rather than a repository of vehicles, The Labyrinth seems to have been the final resting places for many kings and, curiously to us, multitudinous sacred crocodiles.

A quotation from The Pyramids, by J. Davidovits and M. Morris, will amplify the description of the Labyrinth.

This monument must have been one of the most intricate, splendid design wonders of Egypt, with its many doors and confusing maze of winding, connecting passageways that would have confounded any visitor. In modern times only scanty remains of limestone rubble covering an enormous surface area represent the Labyrinth. Every stone has been broken up and removed.

Fortunately, its confounding maze of passages and other features were described by both Herodotus and Strabo, who saw it. Strabo described it as a vast, one-story building with huge pillars and massive, monolithic blocks making up the roofs of its numerous rooms. Herodotus said the building surpassed description and was astonished as he passed from the courts to the chambers, from the chambers to colonnades, and then to other rooms and courts. He viewed only the ground level, for he said he was not allowed to see the galleries below ground. He saw twelve vast-walled courts, six facing north and six facing south, and claimed that the building comprised 3,000 rooms, half above and half below ground. (R1)



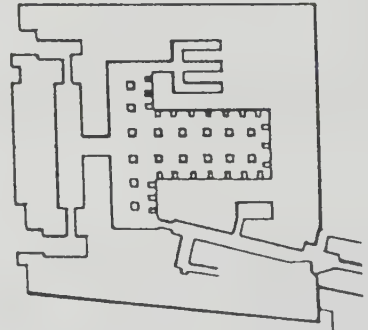
Built about 2,000 B.C., The Labyrinth in the Fayoum contains about 3,000 rooms. (W.H. Matthews; Mazes and Labyrinths, London, 1922)

The ancient Egyptians often built on a grand scale, but they seem to have outdone themselves with The Labyrinth.

X2. The Valley Temple. The Valley Temple is positioned just southeast of the Sphinx on the Giza Plateau. It is oriented precisely north-south to within a miniscule 12 arcminutes. Built into a slope on the plateau, this structure is 147 feet square, with a 20-foot-high western wall and an eastern wall 40 feet high.

The Valley Temple is not just another of Egypt's magnificent temples. It is strange in two ways.

First, it is essentially barren of those colorful decorations and inscriptions that embellish so many ancient Egyptian structures. In this, the Valley Temple seems an alien element in Egyptian architecture--like the product of a different culture perhaps. The lack



The Valley Temple is located just southeast of the Sphinx. Some of its stones are 30 feet long, 12 feet wide, and 10 feet high. (R3)

of inscriptions also makes it difficult to accurately date the Temple and to decide who built it.

Second, the Valley Temple is constructed of gigantic limestone blocks, some of the largest being 30 feet long, 12 feet wide, and 10 feet high. Many weigh over 200 tons, with some approaching 500 tons. (R3) In such circumstances, one always wonders why smaller stones, like those in the nearby Great Pyramid, would not have served equally well. Once again, we are faced with truly colossal stones that were quarried, transported, nicely finished, and then somehow raised (up to 40 feet in the Temple) and finally maneuvered into place.

A photograph of one of the Valley Temple walls from R4 reveals a familiar feature: the presence of interlocking, precision-fit stones of large size. The wall in this photograph could well have come from Cuzco, Peru. But then, the Inca arrived in South America perhaps 4,000 years after the Egyptians built their Inca-style walls using stones that were actually much larger than those we now see in Cuzco!

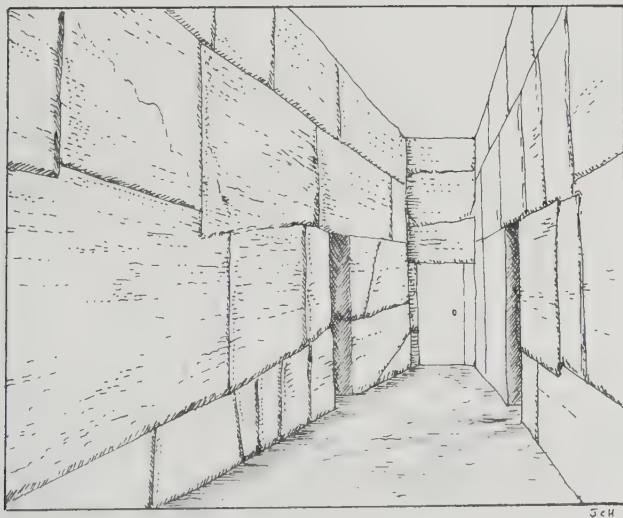
X3. The Osireion. The archeological history of this enigmatic building at Abydos called the Osireion consists of 2,000 years of speculation. When the

Greek geographer Strabo examined the Osireion in the First Century B.C., he supposed it was a "well" or a "fountain." Between 1912 and 1915, E. Naville, who directed excavations at Abydos during that period, ventured that the Osireion was a "reservoir." Everyone seems to agree that, whatever the purpose of the Osireion was, water was somehow essential in achieving that purpose.

Naville remarked that the Osireion lacked the ornamentation and abundant inscriptions typical of most Egyptian architecture, and that it was built with enormous stone blocks. All these features are characteristic of the oldest Egyptian structures, such as the Valley Temple mentioned in X2.

The only recent description of the Osireion we have at hand is by G. Hancock, who personally inspected the site. (R3) He found the Osireion situated in the bottom of the large crater that Naville had excavated. The structure is about 50 feet below the level of the floor of the nearby Seti-I Temple. In fact, the floor of the Osireion is about flush with the local water table, which underscores the opinions of Strabo and Naville that it was a "reservoir" or "well." But the Osireion is manifestly more mysterious than either of these simplistic suggestions, especially in light of its curious configuration, which we shall now review.

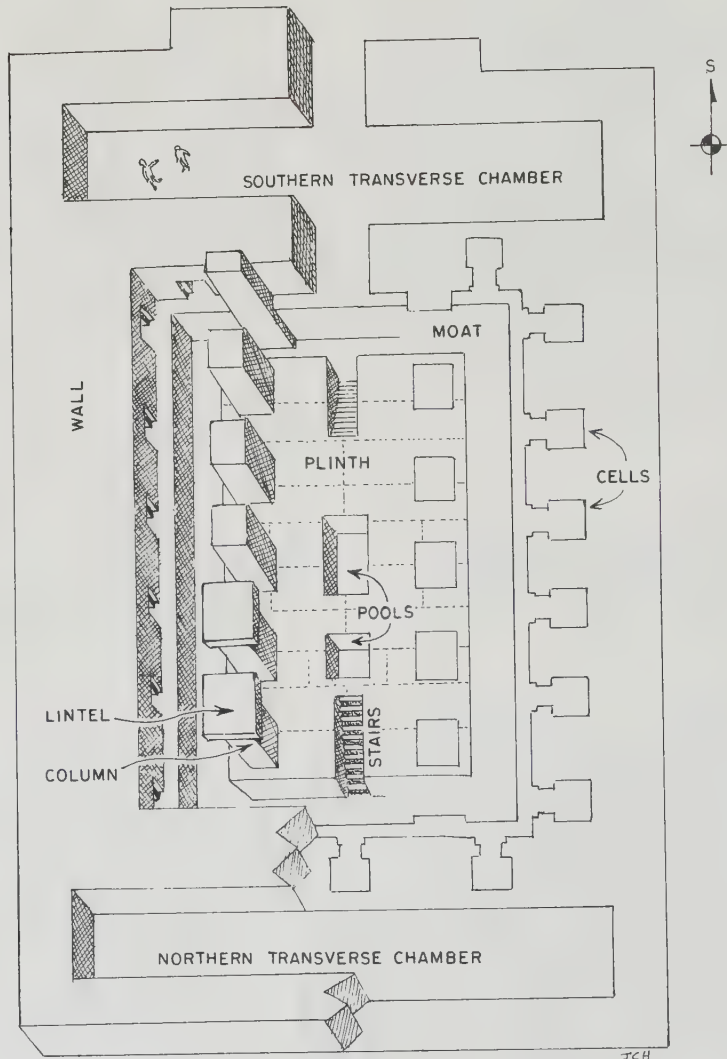
Following Hancock's account (R3), a platform or plinth of huge sandstone



Some of the walls in the Valley Temple contain large, precision-fit, interlocking stones, much like those used by the Inca in Peru. (R4)

blocks occupies the center of the Osireion. The overall dimensions of the platform are about 80 feet long by 40 feet wide. Two pools are cut into this platform, and at either end stairways lead down 12 feet into a moat that surrounds the platform. The platform supports two rows of five squarish columns

each. Said columns are about 8 feet square and 12 feet high. They were fashioned from rose-colored granite and tip the scales at about 100 tons each. Large granite lintels are located atop the columns, suggesting that the entire Osireion was once roofed over with stone slabs.



The Osireion at Abydos incorporates an enigmatic arrangement of cells, platforms, pools, columns, stairs, etc. (Based on a drawing and description in R3)

Attempting to grasp the meaning of the Osireion, Hancock imagined he was perched above the structure.

Looking down in this manner, it was immediately apparent that the plinth formed a rectangular island, surrounded on all four sides by a water-filled moat 10 feet wide. The moat was contained by an immense, rectangular enclosure wall, no less than 20 feet thick, made of very large blocks of red sandstone disposed in polygonal jigsaw-puzzle patterns. Into the huge thickness of this wall were set the 17 cells mentioned in Naville's report. Six lay to the east, six to the west, two to the south and three to the north. Off the central of the three northern cells lay a long transverse chamber roofed with and composed of limestone. A similar transverse chamber, also of limestone but no longer with an intact roof, lay immediately south of the great gateway. Finally, the whole structure was enclosed within an outer wall of limestone, thus completing a sequence of inter-nested rectangles, i.e., from the outside in, wall, wall, moat, plinth. (R3)

Enigmatic geometry indeed! The Osireion was obviously not a reservoir or well. But what was its purpose?

The Osireion's general lack of ornamentation and inscriptions plus the use of enormous megaliths suggested to Naville and others that the structure was very old. Naville opined that it is the "most ancient stone building in Egypt." (R3)

Post-Naville research at the Osireion discovered the cartouche of the Pharaoh Seti I and other hints that the construction of the Osireion was inspired by Seti I, and, consequently that it dates only from about 1,300 B.C. Mainstream archaeologists now presume

that the Osireion is a memorial (cenotaph) for Seti I. This interpretation is opposed by the style of the Osireion's architecture and dearth of ornamentation. Hancock, therefore, wonders whether the links to Seti I might have been added to an older ancient structure during his reign---a practice not unknown in ancient Egypt.

Summarizing, the age of the Osireion remains controversial to off-mainstream investigators. Some avant garde researchers are enamored with the idea that an unrecognized "Osirian" culture preceded the classical ancient Egypt of the pharaohs. It was this supposed older culture that raised the Valley Temple and installed the Osireion in its strange subsurface location.

Regardless of its true age, the Osireion is a very unusual structure. It speaks of mysterious rituals involving water. Perhaps the steps leading down into the moat were used in rites involving immersion, such as baptism! And what were those 17 cells used for? Who knows? If the Osireion was a cenotaph for Seti I, it was certainly a very curious one.

References

- R1. Davidovits, Joseph, and Morris, Margie; The Pyramids: An Enigma Solved, New York, 1988, pp. 23, 217. (X1, X2)
- R2. Time-Life Editors; Feats and Wisdom of the Ancients, Alexandria, 1990, p. 50. (X1)
- R3. Hancock, Graham; Fingerprints of the Gods, New York, 1995, pp. 341, 396, 426. (X2, X3)
- R4. Von Daniken, Erich; The Eyes of the Sphinx, New York, 1996, p. 71, photograph. (X1, X2)

MSF FORTS

Key to Phenomena

MSF0	Introduction
MSF1	Earthen Hilltop Forts: A Survey
MSF2	Notable Ancient Stone Forts: A Survey
MSF3	The Vitrified Forts of Scotland

MSF0 Introduction

Ever since humans began to form into competing social groups, they have been building forts for defense. Hilltops were, and still are, favorite locations for these forts not only for their height advantage but for the unscalable topography nature sometimes provides. To augment the terrain, ancient engineers constructed walls using various admixtures of earth, stone, wood, and brick. Such structures are found virtually every place where humans have settled, but a few of these so-called "forts" may not be what they seem.

Superficially, it is difficult to imagine how piles of earth or stone ringing a hilltop could be anomalous. Closer examinations of some of these ancient forts quickly quashes that notion. The stones of some forts, particularly in Scotland, are partly melted and fused together. This surprising observation certainly deserves an explanation that provides "how," "who," and "why." A second major puzzle is seen in the configurations and locations of some of the hilltop forts. Some, such as Ohio's Fort Ancient, seem militarily indefensible and may instead have been built primarily for ceremonies. If, as seems likely, some ancient structures that have long been assumed to be military in purpose were really built for religious functions, we will have to revise our concepts about how early societies functioned. They may not have been as bellicose as we have supposed!

MSF1

Earthen Hilltop Forts: A Survey

Description. Extensive elevated areas enclosed by earthen embankments. Hill-top forts may occupy 100 acres or more, with a mile or more of embankments. However, in some cases, these "forts" are found in inappropriate locations and their walls are obviously poorly designed for defense, suggesting that they may not have been originally constructed as forts.

Data Evaluation. Considerable professional attention has been directed at hill-top forts, even those in New Zealand. Consequently, our data sources are numerous and generally very reliable. Rating: 1.

Anomaly Evaluation. Hill-top forts have traditionally been considered to be primarily defensive works; viz., Fort Ancient. But the walls of some of these structures are pierced by dozens of entrances and, in addition, are much too long to defend properly. Some are located far from the population centers we suppose that they were built to protect. Observations such as these suggest that some hill-top forts were not built for defense alone. This possibility is contrary to the accepted view of these structures and is therefore moderately anomalous. Rating: 2.

Possible Explanations. Some hill-top forts were ceremonial centers akin to many of the British stone circles.

Similar and Related Phenomena. Long, linear ambankments (MSW1); British cursuses (MSW1) and avenues (MSH3); astronomical alignments of stone circles (MSH17), especially recumbent stone circles (MSH8); all the preceding cross references are to be found in Ancient Infrastructure.

Entries

X0. Introduction. In North America, Britain, and New Zealand, there are hundreds of enclosures that because of their strategic locations and high earthen embankments are popularly designated as "forts." In North America, for example, we have Fort Hill and Fort Ancient, both in Ohio; Britain has Maiden Castle and Knap Hill; and in New Zealand, the Maoris built thousands of their "pas." If all of these "forts" were truly defensive in nature, there would be no anomalies to write about, but some seem poorly designed for defensive purposes for one or more of the following reasons:

(1) Their earthen walls are breached by scores of entrances;

(2) The embankments are just a few feet high and easily scaled;

(3) The "fort" perimeters are thousands of feet long---too long to be de-

fended by a reasonable number of men;

(4) While most of these "forts" are on hill tops and defensible locations, others are not; and

(5) Some of the "forts" are remote from the population centers that one would expect them to protect.

If not exclusively for defense, what other purposes might these earthen "forts" serve? The answer usually advanced by anthropologists is "rituals." These earthen enclosures might well have been places where people congregated for ceremonies, like the British stone circles. Great enclosures of any kind seem to appeal to the human psyche. Of course, the "forts" could also have been honest forts and refuges in troubling times. However, if some of these earthen "forts" were not really the forts that archeologists claim they were, we have to declare a modest anomaly.

The same considerations come to the fore when long, linear embankments are discussed. (MSW1 in Ancient Infrastructure). Some of the British dykes, for example, extend for tens of miles and could never have been manned properly for a credible defense. The chief difference between linear embankments and the earthen "forts" of this chapter is that the latter form enclosures. This type of geometry allows one to call them "forts." We shall now produce some observations that cast doubt on this blanket designation.

X1. North America. In Ancient Infrastructure, we catalog some impressive ancient earthen embankments still traceable in Massachusetts. But the engineering works of the New England Indians pale beside those raised by the Moundbuilders farther west, as exemplified by the Newark Works (Ohio) and the massive terraced mound at Cahokia (Illinois). These same aborigines also built a multitude of earthen-wall enclosures on hilltops and other militarily appropriate locations. Many of these are incontestably true forts. (R1, R2, R9) However, some of these structures popularly called "forts" engender serious doubts as to their military value. Two of these well known edifices have been selected for closer examination: Fort Hill and Fort Ancient, both in Ohio.

Fort Hill. Located in southern Ohio, 30 miles from Chillicothe and 12 miles from Hillsborough, this earthwork is perched on a difficult-to-approach hill top. The wall of mixed earth and stone is about 1½ miles long and is paralleled by an inner ditch. The vertical distance from the bottom of the ditch to the top of the bank is 6-10 feet. The base is 35-40 feet wide. If it were not for the steep hillside exterior to the embankment, a determined foe could easily penetrate such a low-level, lengthy perimeter at some point, even if manned by 1,000 defenders. Furthermore, the wall has no fewer than 33 openings, 15-20 feet wide. Eleven of these gateways have causeways across the inner ditch. This ditch is also puzzling, because it should have been located outside the embankment if intended for defense. Despite the openings, unimposing embankment, and mis-

placed ditch, E.G. Squier and E.H. Davis, did not hesitate to view Fort Hill and an excellent military structure.

Considered in a military point of view, as a work of defense, it is well-chosen, well guarded, and, with an adequate force, impregnable to any mode of attack practiced by a rude or semi-civilized people. As a stronghold, it has few equals; and the degree of skill displayed and the amount of labor expended in constructing its artificial defenses, challenge our admiration, and excite our surprise. (R1)

Even if we follow Squier and Davis and admit some military practicality of Fort Hill, a different sort of paradox was identified by O. Prufer.

There is a certain incompatibility in the facts that on one hand the Hopewellians [Moundbuilders] did not make any identifiable efforts to protect their huge, numerous, and obviously wealthy ceremonial centers in the river valleys while on the other hand they erected large, apparently defensive hilltop enclosures in strategic positions on inaccessible hilltops from which they could hardly protect their ceremonial centers and associated villages...The impression gained is that the people rather suddenly took to the hills, abandoning their centers in the wake of some danger. (As quoted in R13)

The questions are, of course:

- What was this fearful threat? and
- Does Prufer's explanation really resolve the apparent paradox?

Fort Ancient. Just a score or so miles to the west, near Lebanon, Ohio, the Fort Hill paradox is accentuated at Fort Ancient. This astounding system of earthworks is spread out over a narrow convoluted plateau that rises over 200 feet above the Little Miami River. For the necessary statistics and a salient observation, we quote from the prolific pen of G.F. Wright.

Fort Ancient, in Warren County, Ohio, is the most extensive and complicated of all the prehistoric earth-



Fort Hill as surveyed by Squier and Davis, 1848. (R1)

works in North America, and its interpretation one of the most puzzling and at the same time fascinating of archaeological problems. Its total length, following all the windings in its adjustment to the edge of the precipice around which it is built, is 18,712 ft., a little more than three and a half miles. The area enclosed is about one hundred acres. Its longest diameter is 4,993 ft., nearly one

mile. The earth walls vary from 5 ft. to 24 ft. in height and from 20 ft. to 75 ft. in thickness at the base, the height being proportioned to the exposure of the position to be guarded. The total amount of earth contained in the protective wall is estimated to be 172,000,000 cubic feet. (R4)

Volume-wise, therefore, Fort Ancient greatly exceeds Monks Mound at Cahokia



Fort Ancient as surveyed by Squier and Davis, 1848. (R1)

(22 million cubic feet) and Silbury Hill, the largest earthen structure in Europe (9 million cubic feet), as described in Ancient Infrastructure.

Wright also counted the entrances to Fort Ancient.

One of the most perplexing features connected with the fortification consists in the artificial openings which

occur at irregular intervals in the wall. There are 74 of these, and it is difficult to imagine what purpose they would serve. Certainly they were not for purposes of drainage, for they have no relation to that necessity, being at all levels. As they now appear it would seem that they would be a source of weakness, offering favorable opportunities for an attacking party to force an entrance. But per-

haps they were protected by wooden structures which afforded opportunity for the guard within the wall to sally out for attack, or from which they could enfilade the attacking party. Such works are known to have existed in some other enclosures occupied by the Mound Builders, but no positive indications of such wooden structures have yet been discovered here. (R4)

Although Wright terms Fort Ancient a "fortification," he clearly has doubts. So, once again the too-many-entrances problem intrudes. And in Fort Ancient we have a $3\frac{1}{2}$ -mile perimeter pierced by 74 openings. Can such a "fort" really be defended? This point has been raised again and again over the years. Some observers reject the "fort" interpretation completely and instead call Fort Ancient a ceremonial site, but these iconoclasts have been in the minority for many decades.

In 1968, science writer R. Silverberg voiced the accepted scientific consensus on this matter.

A number of modern archaeologists have taken the side of the eccentric [W.] Pidgeon against the more sober judgment of his contemporaries, seeing too many gateways in the "forts" for military installations and suggesting ceremonial functions for them instead. But for once, the simple conclusions of the early theorists seem to have been correct. The "forts" not only look like defensive structures, they were defensive structures, and probably marked the final phase of Hopewell life. (R13)

But times change and paradigms are upended. Just 30 years later, a visitor to the Fort Ancient State Memorial would be exposed to a radically different paradigm in an exhibit located in a brand new museum.

This exhibit tells the basic facts of Fort Ancient proper. The mounds were built between 100 B.C. and A.D. 100 by a sophisticated people who used bone shovels and clam-shell scrapers to load dirt into baskets and then move it 30-40 pounds at a time.

Called the Hopewell, they moved the dirt equivalent of 200 miles of full dump trucks placed end to end.

Until recently, archaeologists

didn't think the Hopewell lived at Fort Ancient. But new discoveries of broken stone tools, animal remains and earthen stains from rotted house posts have changed that opinion.

Archaeologists still believe [!], however, that the site was mainly a ceremonial one used to track the movements of the sun and moon to create a calendar for seasonal events and activities. That belief is based on observations that the 67 [sic] wall openings are in just the right places to observe the summer and winter solstices as well as moon risings over a 9.3-year cycle.

The Hopewell left Fort Ancient around A.D. 300, and 600 years later, the Fort Ancient people moved in. They lived in two villages at the site, and planted crops, built stockades and homes and buried their dead in the vicinity. They left around 1650, before Europeans discovered the mounds. (R20)

More and more questions arise: Why did the Hopewells leave? Where did they go? Why move 172 million cubic feet of earth just to conduct ceremonies and determine solstices? If Fort Ancient was not really a fort, how about Fort Hill and the many other hill-top earthen enclosures in North America? We doubt that the final words have been written in the Fort Ancient saga.

Somewhat surprisingly, the same kinds of questions crop up 4,000+ miles to the east in Britain when Neolithic hillforts are examined.

X2. British hillforts. The Iron Age in Britain (roughly 1,000 B.C. to early A.D.) must have been a dangerous place to live. The island is sprinkled with thousands of defensive structures of various sizes and types. Most are very small, a quarter acre or so, just enough protected land for one or two dwellings. M. Avery calls these small defensive works "fortlets." (R15) In addition to size, archeologists also classify forts according to the building materials used (earth, stone, timber) and how they employed the natural surroundings for defense (hill tops, water barriers, etc.).

Virtually all of these Iron Age structures are nonanomalous. The British

"forts" that do attract our attention are those that resemble Fort Ancient in Ohio. (X1) In other words, we are interested in those earthworks that appear defensive in nature but which may have originally been something else, thereby contradicting the accepted classification.

Sifting through the hundreds of British hillforts that have been described---looking for the most curious and puzzling---we find four that are of interest.

Hambleton Hill. The fortifications at Hambleton Hill, Wiltshire, employed both earth and timber. This site is worthy of space here because of its great size, engineering sophistication, and above all age. Hambleton Hill dates from Neolithic times---millennia before the Iron Age began and contemporaneous with the Great Pyramid.

Hambleton Hill rises beside the Stour River in the chalklands of southwestern England. Almost 6,000 years ago, Neolithic people began erecting a great funeral center and fortress here. When the ramparts were complete, they were visible for miles. The southern and western sides were rimmed by a timber-framed rampart 2,500 meters long. The northern flank was protected by a 1,200-meter multiditch outwork.

A Neolithic herdsman who looked up to the hilltop in about 3,400 BC would have seen an impressive sight. Crowning Hambleton Hill was a huge defensive enclosure with three concentric ramparts. The inner rampart, the most formidable of the three, was supported by 10,000 oak beams as thick as telephone poles. In the ditch around the ramparts human skulls placed at intervals added an eerie note to the appearance of the fortifications. (R19)

Such a construction feat must have taken considerable organization and community energy, much like the pyramids then under construction in Egypt. In the absence of stone quarries and with plenty of forests, Hambleton Hill's fortress was simple wood and dirt, but nonetheless very impressive. Even its great size, however, did not save it from conquest and burning in the end.

Hambleton Hill seems to have been a true fort with all of its walls and ramparts designed to repel attackers.

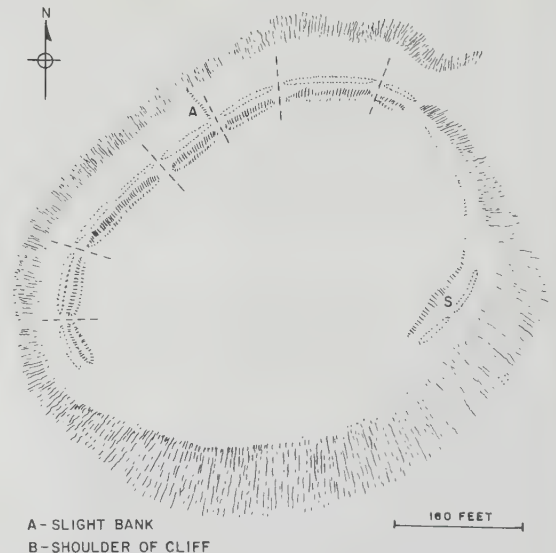
With Hambleton Hill as a military

model, we will see why doubts arise as to the real purpose of the next three structures.

Knap Hill.

Knap Hill is a bold conical-shaped hill, one of a series of capes or promontories standing out on the edge of the chalk plateau that borders, to the north, the Vale of Pewsey [in Wiltshire]. On the south side, overlooking the valley, the hill is very steep and descends in one continuous slope from the summit to the level of the valley below, and on this side there is no evidence of defense, except that afforded by the natural steepness of the hill. But round the other side, when the hill slopes more gradually back to the level of the Downs that spread out behind it, is an entrenchment consisting of a single rampart and ditch, and this forms what is known as Knap Hill Camp.

The ditch has become silted up level, and there are six openings or gaps through the rampart. It was thought at first that, as often happens on ancient banks, some of the gaps were due to cattle tracks, or



Plan of Knap Hill Camp, a British hillfort. The many causeways seem inconsistent with its use as a fort. (R5)



Aerial view of Maiden Castle, Dorset, England. Note the sinuous entrances in the foreground. (Terence Meaden, Fortean Picture Library)

possibly had been made for agricultural purposes. There was, however, a certain regularity about them, and it was difficult to see why on such an isolated spot so many tracks should have been made. (R5)

Excavations ultimately proved that the gaps in the embankment were intentional. Furthermore, as at Fort Ancient, the ditch at these six gaps was bridged by causeways. It is difficult to imagine why all these causewayed gaps were built if Knap Hill Camp was intended to be a fort. The same questions arise at a few other sites in Britain, which have long been considered to be forts in the usual sense.

Maiden Castle. If Knap Hill Camp seems poorly designed for defense, Maiden Castle is even harder to explain as a fort. In their book Mysterious Britain, J. and C. Bord highlight the problem with the "fort" theory as applied to Maiden Castle and some of the other so-called "hillforts" as well.

This aerial view of Maiden Castle

gives an idea of the vast extent of this marvel of prehistoric engineering. It covers an area of 120 acres, with an average width of 1,500 feet and length of 3,000 feet. The inner circumference is about $1\frac{1}{2}$ miles round, and it has been estimated...that it would require 250,000 men to defend it! It is hard, therefore, to believe that this construction was originally intended to be a defensive position.

A great puzzle to archaeologists has always been the multiple and labyrinthine east and west entrances at each end of the enclosure...Originally they may have been built as a way for processional entry by people of the Neolithic era. Later, when warriors of the Iron Age were using the site as a fortress they probably found them useful as a means of confusing the attacking force trying to gain entry. The fact that so many of these 'hillforts' have two entrances---one north of east and the other south of west---also suggests some form of Sun ceremonial. (R14)

The labyrinthine entrance to Maiden



Burrough Hill hillfort, Leicestershire, England, When in its prime, the earthen ridges would have been higher and perhaps bolstered with wooden beams and sharp poles. (Fortean Picture Library)

Castle could also be explained as a psychological device to disorient people attending ceremonies within, like the strange passageway at Alta Vista in Mexico. (MSB2-X1)

Another puzzling fact pointed out by the Bords is the lack of evidence that the interiors of the hillforts were ever permanently occupied to any extent, especially in Neolithic times. In this, we are reminded of sporadic visits of pilgrims to Chaco Canyon in New Mexico. (MSB1-X8)

Comparing Ohio's Fort Ancient and Britain's Maiden Castle, we see that both represent massive engineering undertakings. Both encompass 100 acres or more and are girded by embankments more than a mile in extent. Most interesting of all, though, is the implication that both seem ill-suited to defense.

Durrington Walls. Durrington Walls, like Maiden Castle and so many other famous

ancient sites in Britain, are located in Wiltshire. No one suggests that Durrington Walls constituted a fort. Its long, earthen walls are roughly circular, about 1,300 feet across, and reminiscent of a hillfort. However, they do not enclose a hill top but rather a hollow; and the ditch is inside the embankment rather than outside facing attackers. Altogether, Durrington Walls violates well known military-engineering precepts.

Actually, the embankment-ditch arrangement of Durrington Walls is characteristic of many British ceremonial sites, such as nearby Avebury. Durrington Walls are also breached by entrances at opposite ends like so many of the British ceremonial circles. (R10) And, it must be added, this same feature is seen in many hillforts, even some of those with obvious military value.

Durrington Walls, therefore, resembles in some respects both hillforts and ceremonial circles---a sort of hybrid.

The suspicion arises that many of the British hillforts built during Neolithic times were originally constructed as ceremonial sites rather than forts. A couple thousand years later, Iron Age people may have employed them as real forts, but defense was not their original purpose.

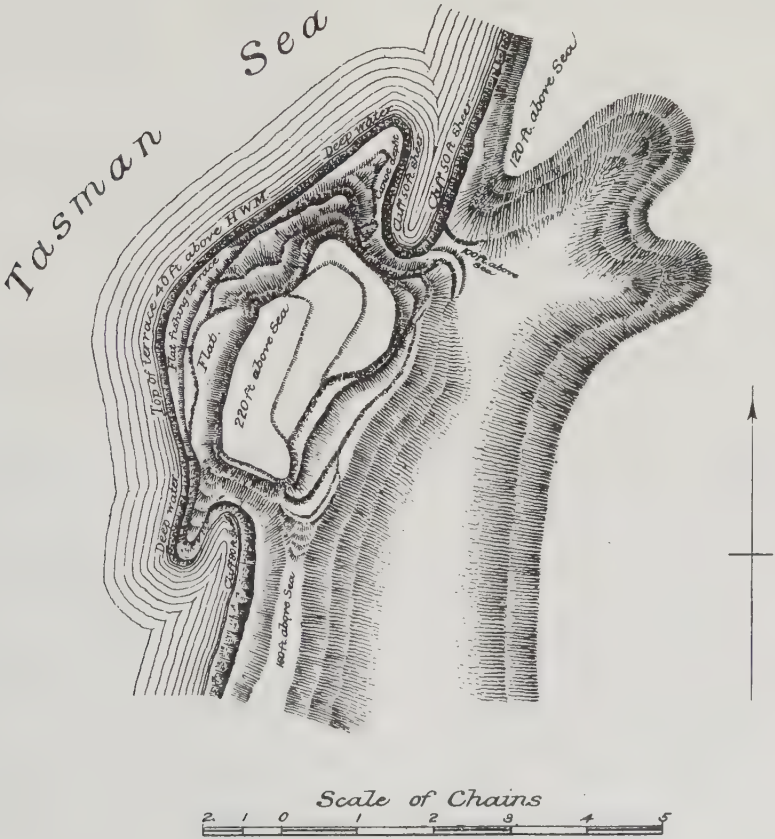
The similarities between these British Neolithic hillforts and some of the hilltop "forts" of North America's Mound-builders are fascinating, even though they are separated in time by 2,000-3,000 years.

tified villages called pas (or pa, singular and plural). Most of these are concentrated on North Island. Three types of pas are recognized in the literature (R17), but the technical differences need not concern us here. What does interest us is the marked similarity of the pas to the British hillforts. Of course, no one suggests any connection between the Neolithic builders of the hillforts (circa 3,500 B.C.) and the Maoris who constructed the pas beginning about 1,300 A.D. (R17) Neither do we see that the primary purpose of the pas was anything but defense.

Nevertheless, the curious similarity of the pas and hillforts is interesting, as are the pas themselves. So, we add a few lines about them here.

X3. The Maori "pas" in New Zealand. Halfway around the world from the British hillforts, in New Zealand, are the remains of between 4,000 and 6,000 for-

For comparative purposes it is interesting to note that the earthworks of



The Otumatua fortified pa, New Zealand, as surveyed by W.H. Skinner, 1911. (R7) Note: 1 chain = 66 feet.

the Maori stronghold are strongly reminiscent of the British hill fortress of the Stone, Bronze and Iron Ages. On the average perhaps, the ramparts of these British forts, notably Eggardon and Maiden Castle, are greater in size than those of the Maori, and owing to the less rugged nature of the English countryside, they tend necessarily to be more elaborate. But to one who has spent many of his leisure summer days in roaming among the ditches, terraces and ramparts of the pa maori, the aspect of the British earthworks is by no means strange.

The function of these fortresses was apparently the same---to protect their inhabitants from external danger and to serve as dwelling places in normal life. In view of this fact their structural resemblance is noteworthy, raised as they were by the hands of people who are separated so widely by geographical situation, by cultural achievement, and by the span of long-dead centuries. One needs to postulate no racial affinity nor far-flung cultural contact between the builders of these earthworks; the evidence warrants no such wild hypothesis of antipodal linkage.

.....

Typical dimensions of these earthworks [the pas] illustrate the range of achievement attained by these workmen of old with their primitive tools. A little fort examined by me some years ago at Tamahere in a bend of the Waikato river was defended by a single vallum and fosse, presenting in their eroded state a combined face of some 12 feet in height; a similar small defended position jutting out from the heights above Muriwai beach was fortified by a single wall some 9 feet high and 3 feet broad at the top. These are but small fighting posts, and represent comparatively insignificant examples of the Maori art of fortification. In the larger pa the ditch and rampart were often of great size. The accounts given of native forts by some of the earlier visitors to New Zealand are of especial interest in this connexion, since they saw these structures complete and often in use. Thus Cook mentions that the ditch and rampart of one pa at Mercury Bay presented a wall 22 feet

high, while the inner vallum and fosse of another fort occupied by people at the same place gave a total height of 24 feet, to which must be super-added the stockade, noted by Banks as being 10 feet high. (R8)

From the accompanying map of one of the pas, we see that the earthworks were elaborate but generally smaller than those of the British hillforts.

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MSF2

Notable Ancient Stone Forts: A Survey

Description. A multitude of ancient stone structures, mostly in the New World, that are commonly called "forts" but some of which possess curious, nonmilitary features. In addition, a few North American structures exhibit signs of intense, puzzling vitrification. From the hundreds of possibilities, we have selected a dozen that are unusual in size, structure, location, and ostensible purpose.

Data Evaluation. Many of our sources are over a century old; but they generally come from respectable science journals. Actually, one can make a case that these old sources are important because they describe archeological sites as they existed before they were severely disturbed by farmers, tourists, and amateur archeologists. Our data evaluations are the first figures in the ratings given below.

Anomaly Evaluation. Our collected panoply of selected "forts" provides us with six anomalies and curiosities, mostly the latter. These are listed below along with our anomaly evaluations, which are the second figures in the ratings.

●Ancient stone forts located in unexpected places: New Hampshire, Washington state, Alaska, Zimbabwe. (X1, X4) Ratings: 1/3.

●Some stone forts of doubtful military value in terms of design and location; others incorporating distinctly nonmilitary structures: Georgia, Peru. (X1, X2) Ratings: 2/3.

●Some North American stone forts intentionally or coincidentally positioned on an east-west line: Ohio, Indiana, Illinois. (X1) Ratings: 1/3.

●Some South American stone forts incorporating immense stones and precision-fit polygonal masonry: Peru. (X2) Ratings: see MSB4.

●Many stone forts characterized by labyrinthine entrances, ritual-associated artifacts, and decorations that imply that they were also used for ceremonies of

some sort: New Hampshire, Tennessee, Ohio, Peru. (X1, X2) Ratings: 1/3.

●Some stone forts exhibiting areas of vitrification: Ohio. (X1) Ratings: 1/2.

Possible Explanations. Some ancient stone forts were dual-purpose military and ceremonial structures.

Similar and Related Phenomena. Earthen hilltop forts (MST1); vitrified forts (MSF3).

Entries

X1. North America. Much has been written about the great earthworks of the Moundbuilders while the ancient stone forts of North America are rarely mentioned. Customarily, one does not picture the North American aborigines as building with stone. Yet, there are scores, probably hundreds, of remains of their stone forts from New England south to Georgia, and west through Ohio, Indiana, and Illinois. In Ohio, especially, they coexist with the large earthen forts described in MSF1.

Some of these stone forts are rather impressive, but compared to those erected by the Inca in South America they are small and unsophisticated. They cannot be considered anomalous by these measures. It is their incongruity and possible nonmilitary purpose that attracts the anomalist.

We normally picture wigwamed Indian villages, perhaps surrounded by a wooden stockade but no stone ramparts. The concept of pitched battles fought from massive stone forts just doesn't fit our preconceptions somehow.

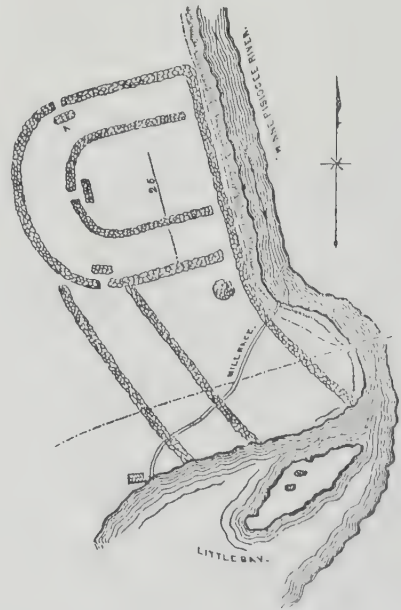
In addition, we know very little about how old these stone forts are and who built them. Some are doubtless only a few centuries old, but others may be 1,500 years old. (R19) There is still much to learn here.

New England. J.W. Mavor, Jr., and B.E. Dix claim that traces of at least twenty Indian stone forts can be viewed in New England. In their book Manitou, they describe three briefly. One is located at Tunbridge, Vermont; another called Queen's Fort, near Exeter, Rhode Island; and the third is found in New Hampshire. (R29)

The latter fort is a remarkable structure for New England---quite out of place. It even attracted the attention of E.G. Squier, who has provided us with

an excellent sketch and a description from 1822, when it was in a more nearly pristine state. The words quoted below are those of a J.B. Moore, a correspondent of Squier, who suggested that the New Hampshire fort might be the work of the Penacook Indians.

The accompanying sketch was taken in pencil, on a visit to the spot, in company with the Hon. James Clark and several friends in the month of September 1822. The remains are on the west side of the Winnepiseogee, near the head of Little Bay, in Sanbornton, New Hampshire. The traces



Sketch of the remains of an ancient Indian stone fort near Sanbornton, New Hampshire, drawn in 1822. (R2)

of the walls were at that time easily discerned, although most of the stones had been removed to the mill-dam near at hand, on the river. On approaching the site, we called upon a gentleman (James Gibson) who had lived for many years near the spot, and of whom we learnt the following particulars: He had lived in Sanborn-ton fifty-two years, and had known the fort some time previous to settling in the place. When he came to the town to reside, the walls were two or three feet high, though in some places they had fallen down, and the whole had evidently much diminished in height, since the first erection. They were about three feet in thickness, constructed of stones outwardly, and filled in with clay, shells, gravel, &c., from the bed of the river and shores of the bay. The stones of which the walls were constructed were of no great size, and such as men in a savage state would be supposed to use for such a purpose. They were placed together with much order and regularity, and when of their primitive height, the walls must have been very strong---at least sufficiently strong for all the purposes of defence against an enemy to whom the use of fire-arms was unknown. (R2)

Referring to the sketch, the width of the U-shaped, double-walled structure was 250 feet north-to-south. When the first European settlers arrived, they found large oak trees growing within the fort. Besides stone arrowheads and hatchets, they also picked up "crystals cut into the rude shapes of diamonds, squares, pyramids, &c." (R2)

While the arrowheads and hatchets point to a military application of this New Hampshire structure, the presence of artificially shaped crystals suggests that rituals of some sort may also have occurred there. Even today, crystals have strong mystical value for some people.

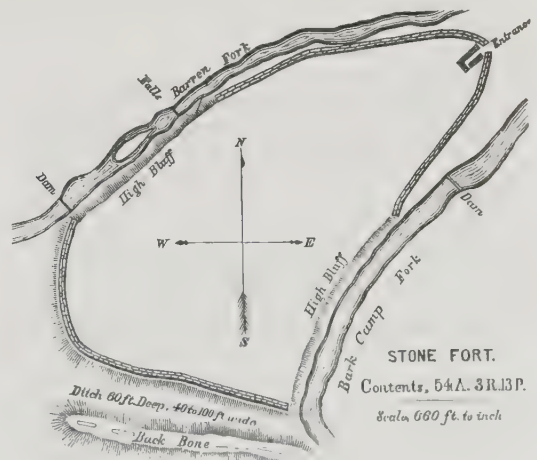
Mid-Atlantic Region. Stone forts do not seem to be a prehistoric feature of the Mid-Atlantic states. One might argue that the remnants of the 10-mile-long wall at Mt. Carbon, West Virginia, might have once constituted a fort, but its great length would seem to render it indefensible. We have treated it as just

one more enigmatic wall in Ancient Infra-structure. (MSW2-X1)

Tennessee. J.D. Singer has mentioned several stone forts in Kentucky and Tennessee. (R24) One of the Tennessee works is remarkable enough to cover in some detail. It is located near Manchester, Coffee County, some 60 miles south-east of Nashville. Depending upon our source, of which there are many, it is called Stone Fort or Old Stone Fort. (R1, R4, R8, R24, R30)

J. Jones (R8) asserted that the map and account provided by Squier and Davis (R1) was incorrect, and he is the source of the accompanying sketch. In his day, Jones was the authority on the antiquities of Tennessee, but we prefer instead a modern description of Old Stone Fort by the Tennessee Department of Conservation. (R30) It is more revealing than that of Jones. Old Stone Fort is now a State Park and tourist attraction, which accounts for the State's interest.

Today the Old Stone Fort lies in ruins on the bluffs high above the Duck River, where it cascades down the Highland Rim near Manchester. Its builders located the enclosure between the forks of the river, a few hundred yards from the point at which the two tributaries--Little Duck



Map of Stone Fort drawn about 1876. It is located about 60 miles southeast of Nashville, Tennessee. (R8, R30)

and Big Duck---come together to form the main stream which flows westward to the Tennessee. Bluffs from 60 to 100 feet high form natural barriers on two sides of the enclosure. The man-made walls, on the north and south sides, cross the neck of land between the forks and terminate where the bluffs afford natural barriers. The south wall alone stretches 2,111 feet from one stream to the other, attesting to the size of the project undertaken by the builders. The total area enclosed by the walls and bluffs is about 54 acres.

The walls, where they still exist, range from three to six feet high. The original walls are thought to have been about the same height as they are today, as there is little evidence of erosion. The walls were filled with loose chunk rock and were often capped by a layer of earth and small stones.

Perhaps the most distinctive feature---and one that gave credence to the legends of European origin---is the entrance to the enclosure. The single opening, located in the north wall, is a cul-de-sac or "booby trap" entrance, consisting of two parallel walls that extend into the enclosure to form a narrow passageway some 120 feet long. This cul-de-sac, it is presumed, could be sealed off after the enemy had been lured into the passageway, and the intruders could be attacked from the walls on three sides. (R30)

Another feature of Old Stone Fort suggestive of a European origin is the 1,200-foot-long water channel parallel to the south wall. This has been construed as a protective moat dug for defense purposes.

Obviously, Old Stone Fort was once an impressive, rather sophisticated structure. But radiocarbon dating denies any European involvement if we adhere to prevailing paradigms. Old Stone Fort was in existence circa 30 A.D., long before De Soto and his men trudged through the area in 1540. Mainstream archeology does not allow any Europeans in Tennessee prior to this date. However, prevailing scenarios are always overturnable!

The State of Tennessee's brochure (R30) asserts that modern scholars are divided as to the true purpose of Old

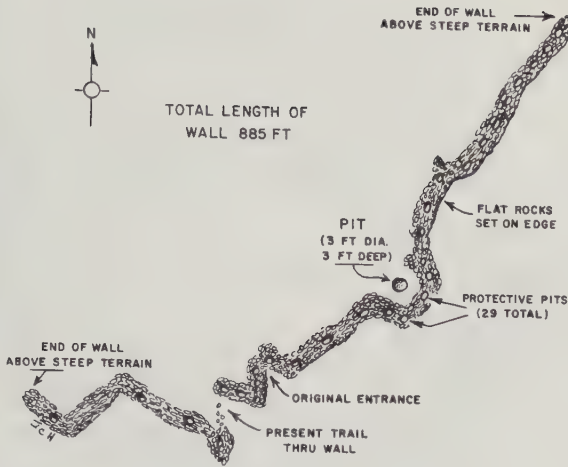
Stone Fort. The structure clearly has military value, but some anthropologists believe that it was really built for ceremonial ends. However, we have seen no reasons given for this statement.

The cul-de-sac at the structure's entrance presents an opportunity for speculation. It reminds us of the labyrinthine entrances at Maiden Castle (MSF1-X2) and Alta Vista, Mexico (MSB2-X1). Such confusing entrances have psychological value and would seem to support the contention that Old Stone Fort might have been a ceremonial site.

Georgia. In extreme northern Georgia, southeast of Tennessee's Old Stone Fort, is an even more enigmatic stone structure. The site's name, Fort Mountain, presumes a military purpose. No one really knows who built the strange zig-zag wall on Fort Mountain, or when. Even the "fort" assumption is questioned, for there is no water on this isolated, 3,000-foot peak, and few if any artifacts betokening past battles have been picked up by archeologists. A.R. Kelly, an anthropologist at the University of Georgia, thinks the site was really a religious shrine probably built about 2,000 years ago. (R22) Perhaps so, but why, then, the zigzag stone wall?

To better appreciate the curious plan of the Fort Mountain structure, we go to a description from the Nineteenth Century written long before modern visitors and picnickers climbed the peak to appreciate the spectacular view, have picnics, and move the stones about.

The northern end of the summit is separated from the rest of the mountain by the stone wall which constitutes the fort. The enclosed space is some eight acres in extent, about one-half being almost level, and the remainder in easy slopes. The northern edge of this space needs no defensive wall, for there the cliffs descend in rocky inaccessibility. Rounding, too, on the eastern and western sides, the cliffs are wild and steep, and, although not so sheer and abrupt as at the northern end, are yet so abrupt as to make it impossible for an attacking party to scale them in the face of even the slightest opposition. Toward the south, however, there is no natural protection, and there it is that the wall is built, stretching from side to side of the



Plan of the stone wall atop Fort Mountain, Georgia. (R26)

ridge. And the construction of the wall is remarkable in the extreme, considering that it was undoubtedly the work of an aboriginal race. It is not straight. It is not curved. Instead, it is built in zigzag lines, and quite evidently with the intention of making it impossible for any assaulting force to advance without being taken in flank, unless they should charge right against the outer point of one of the angles.

The wall, while of zigzag shape, is yet not built with regularity. The angles vary greatly in degree and the zigzags are of different lengths. One salient angle, which projects a rounding outward, measures, on one side, fifty feet to the beginning of the curve of the point. On the other side it measures sixty-four feet. The diameter of the curve of the point is twenty-four feet. The height of the wall is now not more than from two and a half to three feet, but the stones lie scattered in a width of from fifteen to twenty feet, and the universal testimony of all who know anything of what it was in former days is that it was narrower and higher.

.....

The wall is from a fifth to a sixth of a mile in total length. The stones were heaped up---not regularly and

evenly piled, and in this respect the wall resembles that of Fort Hill, in southern Ohio. [MSF1-X1] In the Fort Hill wall, however, there is a considerable admixture of earth, while the wall on Fort Mountain is of stone alone. There are but few small pieces in the wall. Most of the stones are from two to five inches thick, range from eight to eighteen inches in length, and are from six to twelve inches wide. (R26)

The geometry of the Fort Mountain wall certainly bespeaks a defensive purpose. So do the 29 crater-like, perfectly round "foxholes," each about 4 feet deep, that occur about every 75 feet along the wall. Despite all these defensive devices, defenders could have easily have been trapped within the structure without any escape routes and no water. These considerations reduce the military value of Fort Mountain.

The question of the identity of the wall builders has evoked some wonderful speculations. As usual, the DeSoto expedition is mentioned first. Price Madoc is a close second. About 1170, Madoc and 200 other Welshmen are supposed to have landed at Mobile Bay, long before Columbus and DeSoto were even born. Driven north by hostile Indians, they made their last stand at Fort Mountain. But the Cherokees overran the wall and, some say, absorbed some of the Welshmen into their culture. Actually, Cherokee legend holds that the wall on Fort Mountain was constructed by a race of "moon-eyed" whites. Supporting such wild surmise is the indeterminate racial origin of some of the mountaineers in the region. (R15, R22)

Arkansas. Mysterious stone forts also exist in the Ozarks. Two of the most prominent are at Cane Hill and Cedar Hill, just north of the Arkansas River and near the border with Oklahoma. We know little about these forts except that DeSoto also built them! (R23)

Ohio. Not only does the State of Ohio provide us with the great earthen "forts" of Fort Ancient and Fort Hill, but also several stone forts of more than usual interest. Two of these stone forts exhibit curious entrance geometries, and two display areas of vitrification; that is, the application of intense heat. This latter characteristic is reminiscent of

the Scottish vitrified forts. (MSF3) Even though we cannot reasonably claim any trans-Atlantic cultural connection, we are, as anomalists, required to flag all examples of intense vitrification seen in ancient structures.

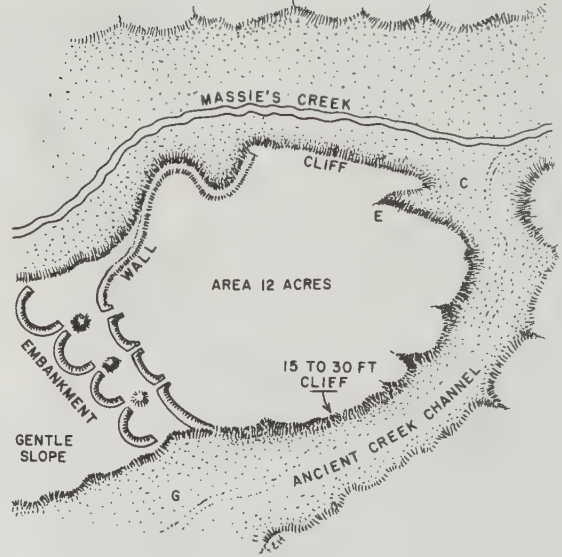
The unusual entrance geometries are found at stone forts located at Massie's Creek and Bourneville, both in south-western Ohio. At both sites there are crescent-shaped walls separated by mounds, as seen in the two site maps. S.D. Peet, writing in the American Antiquarian for 1891 speculated about the purpose of these strange constructions.

Our conjecture is that these were designed as symbols. This last fort [Massie's Creek] is beautifully situated on a hill-top, but is attended with a large square enclosure situated in the valley. The fort has a series of gateways guarded by conical mounds, and an outer wall, divided into four sections, in the shape of crescents. The enclosure is nearly square, and is attended with several earth embankments, which are also in the shape of crescents. The impression gained is that here was a settlement of sun-worshippers. (R12)

Peet did not explain why he thought the builders of the two forts were sun-worshippers. We should recall, though, that Fort Ancient with its claimed astronomical alignments is nearby, and that the labyrinthine entrance to Britain's Maiden Castle has been associated with ceremonies. (MSF1-X1, MSF1-X2)

Bourneville, positioned 12 miles west of Chillicothe, attracts our attention for its "symbolic" entrance and also its areas of vitrification. This "fort" is situated on a detached hill about 40 feet high with precipitous sides. Most of the "fort's" stone wall is unremarkable, except at the entrance.

The gateways are formed by curving inward the ends of the wall for forty or fifty feet, leaving narrow passages not exceeding eight feet in width. At other points where there are jutting ridges are similar gateways, though at one point a gateway seems to have been for some reason closed up. At the gateways the amount of stone is more than quadruple the quantity at other points, constituting broad, mound-shaped heaps.



Stone fort on Massies Creek, Ohio.
Note the curious arrangement of the entrance. (R12)

These stone mounds exhibit the marks of intense heat, which has vitrified the surfaces of the stones and fused them together. Strong traces of fire are visible at other places on the wall, the point commanding the broadest extent of country. Here are two or three small stone mounds that seem burned throughout. Nothing is more certain than that powerful fires have been maintained for considerable periods at numerous points on the hill. (R12)

One must inquire into the purpose of these intense fires. Were they lit during a ritual of some sort or were they set by an attacking force? Ceremonial conflagrations would fit in with the strange entrance geometries.

More traces of concentrated heat are evident at a third Ohio stone "fort." This site is located on a high plateau at Foster's, Warren Country, on Ohio's Little Miami River. Areas of vitrification here are quite remarkable, as reported by F.W. Putnam to the American Antiquarian Society in 1890.

The whole circumvallation is made up of a carefully laid wall of flat stones



Squier and Davis surveyed this fort located near Bourneville, Ohio. In addition to strange vitrified areas, this fort has a complex entrance. (R1)

along the outer side several feet in height; behind this are loose stones, both large and small, making nearly half the structure; and behind and over these stones a mass of clay burnt to all degrees of hardness, from that only slightly burnt to great masses of slag, showing that the clay had been subjected to very great heat, in places forming a vitreous surface over the slag, which resembles that from a blast furnace. In many places the limestone had been burnt in varying degree, and here and there large quantities of pure lime were found. Large pieces of charcoal and beds of

ashes were discovered in many parts of the structure. At one place on the north side, where the burnt material runs out in the form of a low mound nearly one hundred feet long and eighty feet wide, there was a larger quantity of charcoal and ashes than in other parts of the work explored. Here was also uncovered a singular wall of small stones about six feet long and two feet high. At every part of the work through which a trench was dug the same story was told,---burnt stones and clay, ashes and charcoal, and the mass of stones, faced on the outer side by a good

stone wall...

This is one of the most remarkable structures I have seen, and one that should be more thoroughly examined before we can hope to get its meaning, or find the additional evidence of occupation which will lead to knowledge of the people who did this strange work. Its singular construction and the manner in which the extensive burning was accomplished, as well as the uses of the work itself, make one of the greatest puzzles for the archaeologists. (R11)

Putnam's account reinforces the notion that some stone forts were not defensive at all but were built for other purposes, one of which might be ceremonial. The presence of so much charcoal and limestone at the Foster's site, suggest some sort of metal working was carried out there; or perhaps there were kilns requiring intense heat. After all, Ohio is also noted for claims of old iron furnaces. (MS11)

Indiana. Clark County, Indiana, lies just north of Louisville, Kentucky, in the southern part of the state. Here, the Moundbuilders raised an unusual fort that included a wall section said to be 75 feet high! The following description is by E.T. Cox.

One of the most remarkable works left by the mound-builders is seen in Clarke [sic] County, Indiana, fourteen miles above the Falls of the Ohio River. It is an ancient stone fort, built upon the terminal point of a high ridge, which is washed on the south side by the Ohio River, and on the north by Fourteen-mile creek, a broad and deep stream which empties into the Ohio a short distance below.

The point of the ridge is pear-shaped and the fortification includes from eight to ten acres. The highest point at the stem of the pear is 280 feet above the Ohio River and is here only ten to twenty feet broad, with the corniferous [sic] limestone two to three feet thick exposed at the surface, and the Niagara limestone beneath, and reaching down into an almost perpendicular wall to the river. A natural wall of Niagara limestone also furnishes complete protection against the approach of an enemy at

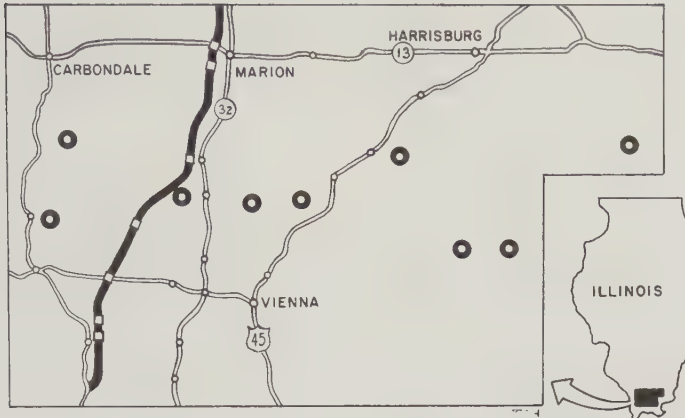
the upper part of the fort with the exception of a short gap on the creek side, extending from the upper point southward for about 100 steps. This break in the natural wall is protected by an artificial wall, seventy-five feet in height, made by laying up loose stone, mason fashion, but without mortar. The base of this wall for sixty-five feet in height follows the slope of the hill and then rises ten feet vertically.

Around the southern terminus of the point is another artificial stone wall ten feet high which connects the two natural walls of Niagara limestone, thus forming a complete barrier to the approach of foes. On the inside of the made wall are numerous mounds of earth, and within the line of these mounds there is a dug ditch four feet deep and twenty feet wide which receives the drainage from the crown of the hill. (R5, R6)

Illinois. From the above descriptions, it is apparent that ancient stone forts are distributed along a line through southern Ohio, southern Indiana, and, as we shall now see, southern Illinois, too. We do not know the significance of this alignment if such there be.

At least, nine pre-Columbian stone structures are known to exist in the hills of southern Illinois. There may be others, the walls of which have been razed down to ground level; in fact, the latest find was made when the foundation courses were accidentally observed, three miles east of Cobden.

These walled structures, forming a rough alignment across the southern tip of Illinois between the Mississippi and Ohio rivers, have one striking feature in common---each is located on top of a high bluff where it projects outward. From the rear, they can be approached easily over gently sloping ground; and it is across this approach that the walls are built. On every other side, the structures border on sheer cliffs. This would suggest that their primary purpose was as forts; however, only one (that near Stonefort in southern Saline County) has a water supply within it. Stone cairns and stone-lined pits are found beside the entrance gateways of all.



Locations of some of the enigmatic stone structures in Illinois. Most of these were probably forts. (R16)

They are constructed of dry-stone masonry, using loose stones of moderate size, mainly from the beds of the brooks flowing along the cliff bottoms. Early records, and the recollections of very old people still living, indicate that the walls were originally six feet high and about as wide. They are now greatly diminished, due to farmers hauling away stones from them. Some, such as the one near Stonefort already referred to, were over 600 feet in length. The amount of labor necessary to build such walls, of stones that had to be carried up from the brook beds 200 feet below, is staggering.

The wall at the Stonefort structure forms half of an accurate ellipse with axes of 450 and 190 feet. It is not easy to see how it could have been so accurately laid out, if the area were as heavily forested at the time as it is now. (R26)

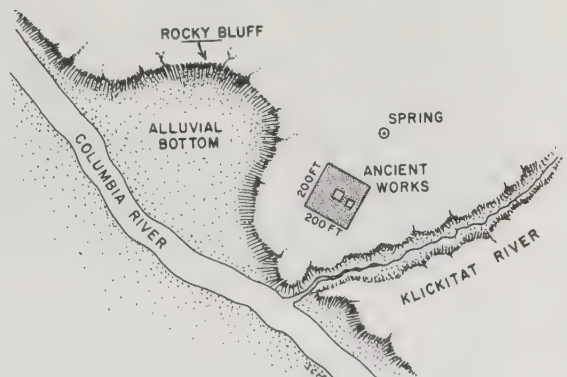
We have, it seems, a line of forts stretching from southern Ohio west across Indiana and Illinois---a veritable Maginot Line of fortified hilltops. But against what threats?

It should be added that some say that these forts mark the trail of Prince Madoc and his Welshmen as they made their way westward to become assimilated with the Mandan Indians! (R17)

Washington. The fort described below is located about 10 miles northwest of

The Dalles, Oregon. We know nothing more about it, but it sounds interesting!

The works represented in the accompanying sketch consist of a stone wall 5 feet high, filled inside with earth, except the two squares within. These are 8 feet deep and 15 feet on each side, the whole work being about 200 feet on either side. There was formerly some kind of wooden structure on the stone wall, as the remains of cedar timbers occur at certain points on the top. The wooden work was evidently destroyed by fire, since all the cedar is charred.



Map of the ancient works on the Klickitat River, Washington. (R9)

None of the Indians in this country has any knowledge of the builders or of its use. There is a tradition among them that it was finished a long time ago. Large quantities of arrow-heads are found in and about the works. The place is eminently adapted for defense, being 100 feet above the river. The scarcity of aboriginal works of a permanent character on the Pacific coast makes this an object of peculiar interest to the archaeologist. (R9)

Alaska. Another all-too-brief report of a stone fort comes---unexpectedly---from Alaska. We must assume that neither Prince Madoc nor DeSoto made it this far north!

Reports of finding inaccessible rock fortresses on the sea, used by people of the Far North many centuries ago, are brought back from Kodiak Island, Alaska, by Dr. Ales Hrdlicka of the U.S. National Museum.

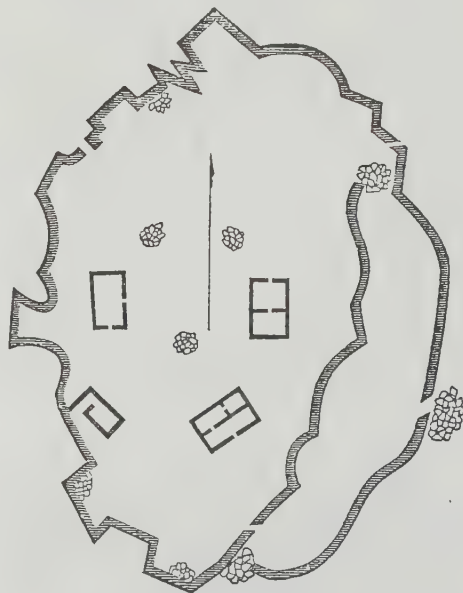
Dr. Hrdlicka's discovery reveals for the first time that the inhabitants of the North in ancient times had to take extreme methods of protection, very much as the Pueblo Indians in the Southwest entrenched themselves on mesa tops. The fortresses discovered in the North are rocky islets off Kodiak Island coast. On the flat summits of these high cliffs, Dr. Hrdlicka discovered ruins of villages strategically placed by the ancient people who had some formidable enemy to fear, perhaps because they had enviable sea otter skins. (R14)

The nature of these fortresses is not spelled out, and no hints are given as to the identities of the defenders and attackers.

Mexico. Undoubtedly, there are many stone forts in Mexico that we are not aware of, for we catalog hundreds of tower-type forts just to the north in New Mexico. (MST2). However, we have so far found only an account of one of them, as presented below by E.G. Squier.

An ancient fortress, which no doubt well illustrates the character of the ancient Mexican defenses, is figured and described by Du Paix. A plan of it is presented in the subjoined engraving. "It occupies the summit of

a steep, isolated rock, about a league west of Mitlan. This rock is accessible only from the eastern side. The wall is of solid stone, twenty-one feet thick and eighteen high and is about



Ancient fortress near Mitlan, Mexico. (R2)

a league in extent. It forms, in its course, several salient and retiring angles, with curtains interposed. On its assailable side, where is its principal entrance, it is defended by double walls, which mutually flank each other. The first, or most advanced, forms an enceinte, or elliptical rampart, upon which, at short intervals, there are heaps of small round stones for slinging, and in the centre of the crescent there is an oblique gate, to avoid the enfilade or right line of arrows, darts, and stones. The second wall, which is joined at its extremities to that of the fortress, is of greater elevation, and forms a sort of *tenaille*. It differs from the other in having its sides or flanks more open. It has likewise its rampart and heaps of stones. For greater security, batteries were disposed in the Aztec system of defence, in front of the fortification, consisting of loose round stones, about three feet

in diameter, placed high, and so balanced as to be easily precipitated below. (R2)

X2. South America. The inhabitants of Precolumbian South American were just as belligerent as their distant neighbors in North America. Consequently, we do not have to look far to find forts, particularly along the Pacific Coast, where the Chimu and Inca empires held sway. These two cultures built on a grand scale. Small boulders plucked from nearby streams and arranged in walls, such as were common in ancient North America, were inadequate for these more advanced cultures. The Chimu built huge defensive structures from millions of adobe bricks, while the Inca arrayed

immense stones in those formidable walls at Sacsahuaman and Ollantaytambo.

We begin with the Chimu fortress at Paramonga, since it is the oldest.

Peru

La Fortaleza. Paramonga is situated on Peru's Pacific coast about 200 kilometers north of Lima. Here, a few kilometers inland, still in sight of the ocean, the Chimu built a great stronghold from untold numbers of adobe bricks. Named La Fortaleza by the Spanish, this structure was part of the southern defense line erected by the Chimu to halt the expanding Inca empire. But La Fortaleza could not stop the Inca armies of Pachacuti, and the Chimu empire was overwhelmed circa 1475. The Inca conquerors, however, appreciated La Fortaleza and subsequently modified it to suit their



La Fortaleza, the fortress at Paramonga, was begun by the Chimu and later modified by their conquerors, the Inca. It is located 200 kilometers north of Lima on the Pacific coast. (Servicio Aerofotografico Nacional, Peru)

purposes. (R19, R20)

The accompanying photograph reveals a militarily sophisticated structure that demonstrates the engineering talents of the Chimu and Inca. The military philosophy employed at La Fortaleza differed from that used in the fortresses being built in Europe in this time frame. The Chimu and Inca had to contend only with short-range weapons, such as arrows and slings. Therefore, we do not see the very long projecting bastions the Europeans had to build on their forts to keep cannon at a distance from the forts' centers. La Fortaleza was properly designed for only pre-Conquest warfare---and therefore was not particularly effective against the Spanish. (R19)

Here is what La Fortaleza looks like today:

The fortress consists of three superimposed terraces (with an overall height of about sixty-six feet), built entirely of adobe reinforced with pebbles, and occupying the top of a natural rise, or spur. The foundation terrace extends outward with four so-called bastions of varying sizes; they are basically prolongations of the breastwork of the main structure, and have many nooks and crannies, recesses and projections. The diagonal junctures of these several protuberances suggest other Andean defensive structures, such as that at Marca Huamachuco (with its angled bastions on the ring of walls, and its angled internal structures) and the fortress above Cuzco, Sacsahuaman (with the sawtooth shape of its three terraced walls). (R20)

While obviously defensive in outward appearance, La Fortaleza contained chambers and niches that were gayly decorated in yellow, white, and red. These and other features imply that La Fortaleza may also have served as a ritual center, much like some of the cruder North American stone forts.

For this catalog, the importance of La Fortaleza lies in its engineering sophistication, which certainly seems to have been comparable to that seen in contemporary European fortresses. Of course, it was different because the weapons in use were different.

Sadly for modern archeologists, the adobe bricks of La Fortaleza and the similarly constructed Chimu pyramids

(MSP1-X3) have not fared well under the rare rainfalls of the region. Still, their original grandeur is inescapable.

Sacsahuaman. Photographs of Sacsahuaman adorn the archeology and travel magazines. The three tiers of colossal interlocking stones deserve all the attention they get. Some of the precision-fit stones weigh upwards of 100 tons. Unquestionably, Sacsahuaman is one of the wonders of ancient South America.

The accomplishments of its Inca engineers are remarkable, but Sacsahuaman poses still another problem. Why did the Inca build it? The media all classify it as a fortress---and it certainly looks like one---but there is more to the story. Sacsahuaman was apparently not only a military structure. Its "other" purposes are the real focus of this catalog entry. Before speculating on these, it is necessary to describe what is left of Sacsahuaman.

Sacsahuaman is rather young as South American archeological sites go. Work on the site began about 1438 and was in progress when the Spanish arrived. It is uncertain exactly what the Spanish found, because they cannibalized Sacsahuaman for building materials for the city of Cuzco, which is just south and 200 meters below Sacsahuaman's plateau. All that is left are the stones that the Spanish could not move or didn't want. What remains hints of not only a fortress but also of a remarkable complex of structures that once existed behind the zigzag facade of monstrous stones. There were at one time towers, storerooms, chambers, a labyrinth of underground tunnels, reservoirs, and a subterranean aqueduct leading to a spring 2 miles away. We can only guess at what Sacsahuaman would have looked like if it had ever been completed.

The "fortress" aspect of Sacsahuaman has been well-described by E. Guidoni.

The main fortress was said to have been planned by Pachacuti and the work begun under Topa Yupanqui, but although the work continued for more than fifty years, it was not yet completed by the time the Spaniards arrived. Three walls, erected on terraces and built of enormous stones, formed a powerful defensive barrier that faced out over Cuzco; on the opposite side, a simple wall closed in the fortress, for it set along the



This sketch of Sacsahuaman by E.G. Squier was published in 1877. (R7)

edge of a natural precipice. The three walls or ramparts have a total height of sixty feet; the outside, or lowest, one reveals the most accurate building techniques as well as the largest stone blocks. (One of these

stones is twenty feet high, ten feet wide, and nine feet thick.) Three doorways opened through this lowest wall, but all were easily defended. Inside each of the three walls was a trenchlike gallery for the guards to



Sacsahuaman as one sees it today. (C. Casale)

make their rounds in (similar to the one at Paramonga). (R20)

From the above, we can understand why what is left of Sacsahuaman is called a fortress. But the structural remains behind the three walls speak to additional uses for the completed site. Some speculate that Sacsahuaman was really intended as a refuge or retreat for the Inca and his nobles. (R19) It may have been planned as the headquarters of the Inca. Guidoni wondered whether it was simply a symbol of power. (R20) More recently, archeological opinion has been gravitating towards a religious function for Sacsahuaman. (R27) This diversity of opinion about the real purpose of Sacsahuaman (and many other ancient, so-called "forts") presents a real archeological conundrum, one that it perhaps more important than the one that most popular writers dwell upon: namely, those huge stones dominating Sacsahuaman's military facade.



The Sacsahuaman "fort" is basically a series of terraces that incorporate truly immense stones.

How did the Inca engineers ever quarry, transport, dress, a precision-fit those 100-ton stones? They did their work so well that Sacsahuaman's interlocking stone walls are still standing while those of nearby Cuzco have succumbed to at least two major earthquakes since the Spanish arrived there. The question of how the Inca made their walls comes up several times in this

book, so it is treated separately in depth in MSB4. In brief, we are still not sure how they did it! It is just one more South American anomaly.

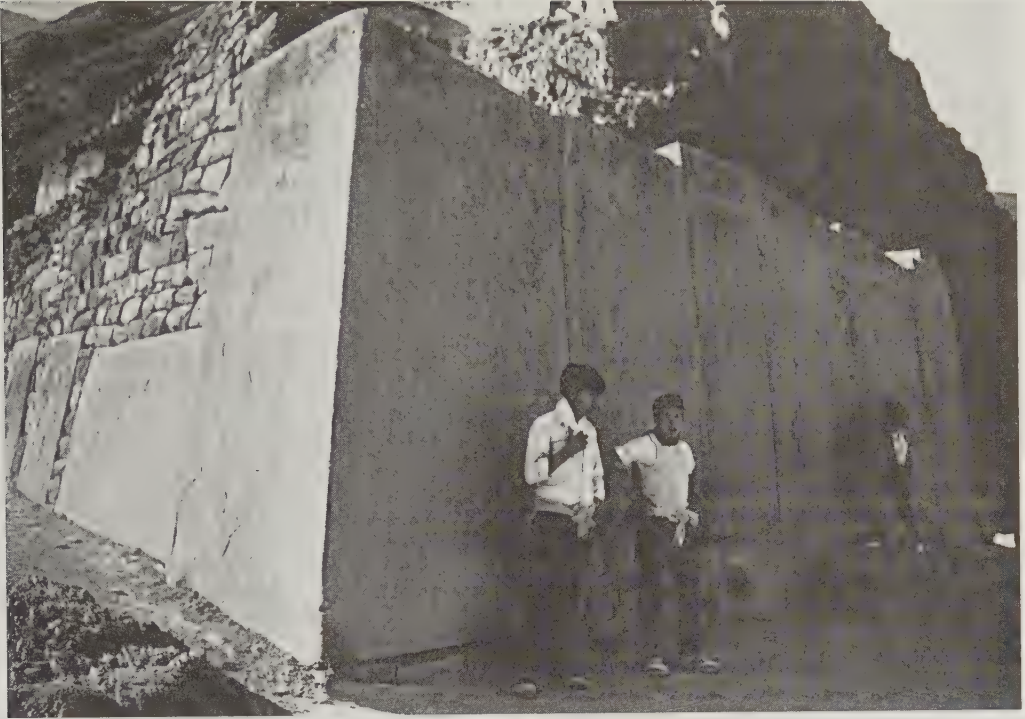
Ollantaytambo. The walled city of Ollantaytambo is situated about 70 miles northwest of Cuzco. The Inca "fortress" at Ollantaytambo was built in the late Fifteenth Century to hold back jungle tribes. The Ollantaytambo fortress, like Sacsahuaman, is a magnificent example of Inca architecture and stonemasonry. Instead of Sacsahuaman's three tiers of immense stones, there are five at Ollantaytambo. The stones are polygonal and precisely fit together to resist earthquakes. (MSB4) Again like Sacsahuaman, Ollantaytambo was unfinished when Pizarro appeared in 1536.

The five tiers of huge stones do not interest us as much as the structures the Inca was apparently planning at the top of the hill that was protected by the five tiers of stone fortifications. Apparently, some sort of sacred or ritual structure was contemplated. The major evidence for this extra dimension of Ollantaytambo is seen in a row of six colossal stones set on end to form a wall about 13 feet high. The largest of these stones is 13 feet high, 7 feet wide, and 5½ feet thick. Unlike the polygonal masonry in the tiers below, the straight vertical sides of these six stones are separated by five, curious, thin slabs of stone---a very unusual feature for Inca stonework. Interestingly, one of the large, upright stones has a T-shaped slot carved in it to hold a metal clamp---just like some of the big stones at Puma Punku near Tiahuanaco. (MSB5-X3) (R19, R20, R25)

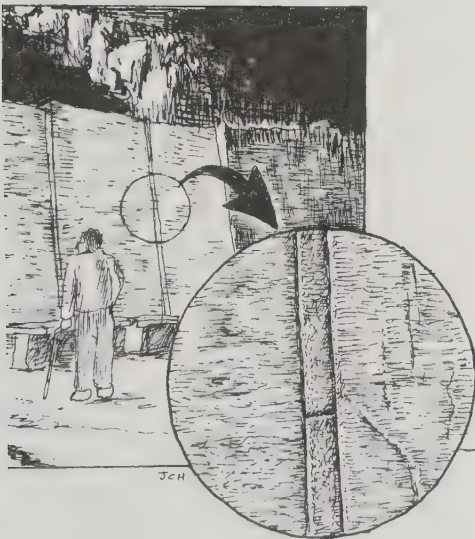
The stones for Ollantaytambo were quarried at a site across the river that runs below the fortress. On the bottom of this stream lies a 250-ton stone that was destined for Ollantaytambo, suggesting that the Inca had even more ambitious structures in mind for the site. (R25)

In Ollantaytambo we obviously have a fortress facade and, at the top, an unfinished architectural work of uncertain purpose. As is usual with ambiguous structures in archeology, we suppose that rituals were planned for whatever edifice crowned the complex; but no one can really know what the Inca was thinking.

There seems to be still another extra



The wall of six immense stones at Ollantaytambo, Peru. The largest is 13 feet tall. For some unplumbed reason, the stones are separated by thin stone slabs, as shown in the sketch below. (C. Casale)



dimension to Ollantaytambo---an artistic, even transcendental property. The same sort of mystical feeling that architects try to build into cathedrals. E. Guidoni put it this way:

It appears to aim at an extreme harmonization of the organizing role of the state with the disintegrating forces of nature. (R20)

Did the Inca strive to erect a monument that would survive an impending apocalypse; an earthquake or perhaps the star-forecast end of the Inca cycle of ascendancy?

The structure at Ollantaytambo represents the zenith of Inca culture and architectural genius, but its real message is unclear to us.

X3. Asia.

Sri Lanka. The only substantive mention of the so-called "Sigiri fortress" we have found so far appeared in 1888 in Scientific American. This brief article tells of the scaling of Sigiri Rock by a British Army officer and, in passing, provides some information about the fortress that was built around the singular geographical feature named "Sigiri Rock."

The rock is cylindrical in shape, and the bulging sides render the ascent very difficult and dangerous. There are galleries all round, a groove about 4 inches deep being cut into the solid rock. This rises spirally, and in it are fixed the foundation bricks, which support a platform about 6 feet broad, with a chunam-coated wall about 9 feet high. The whole structure follows the curves and contours of the solid rock, and is cunningly constructed so as to make the most of any natural support the formation can afford. In some places the gallery has fallen completely away, but it still exhibits flights of fine marble steps. High up on the rock are several figures of Buddha, but it is a mystery how the artist got there, or how, being there, he was able to carry on his work. The fortifications consist of platforms, one above the other, supported by massive retaining walls, each commanding the other. Owing to the falling away of the gallery, the ascent in parts had to be made up a perpendicular face of the cliff, and General Lennox and four natives were left to do the latter part of the ascent alone. The top they found to be a plateau about an acre in extent, in which were two square tanks with sides 30 yards and 15 feet respectively in length, cut out of the solid rock. A palace is believed to have existed on the summit at one time, although time, weather, and the jungle have obliterated all traces of it. (R10)

Unfortunately, we have no information as to the builders of the Sigiri fortress, assuming that is what it really was, nor do we know when it was constructed. It certainly bears no resemblance to the ancient forts of the New World.

X4. Africa

Zimbabwe (formerly Rhodesia). Some areas of Zimbabwe are strewn with the remains of ancient stone structures, of which the Great Zimbabwe (MSS4) is a prime example. Many hill-top forts once formed a key part of this array of buildings, aqueducts, walls, pits, etc. We get an overview of these impressive, under-reported works in a 1905 paper by R.N. Hall.

The Inyanga Range lies in south-eastern Zambesia, and is a wild mountainous country rising to 10,000 feet above sea-level. The district is 250 miles north of Great Zimbabwe, and 300 north-east of the Matopopo Hills. The Inyanga Mountains cover an area extending about 100 miles from north to south and 60 miles from east to west, and lie inland 200 miles west of the shore of the Indian Ocean. An area of this range, some 60 miles by 40 miles, is covered with the traces of some long-forgotten people.

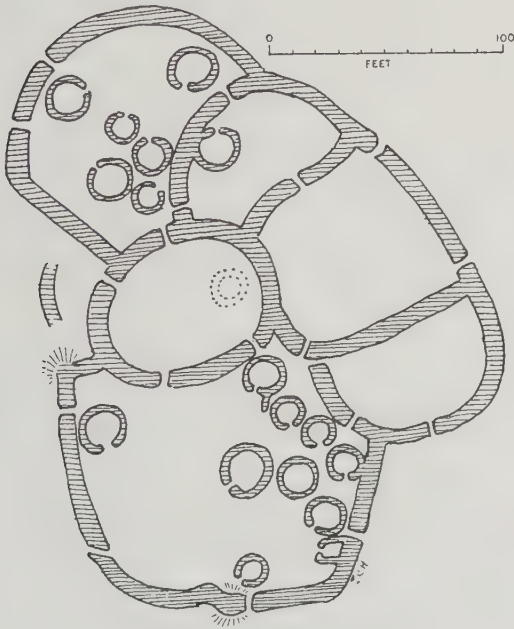
The hills are of both granite and blue slate. Their form is that of long lines of very high perpendicular cliffs, each line of cliffs extending for miles. The hills on the granite formation are rugged and most fantastic in shape. Those on the slate formation have graceful curves and are gently rounded. Between the lines of cliffs are rolling downs of great extent. On the summits of the hills are stone forts, possibly a hundred of these structures, while up the sides of the hills, from base to summit, are stone terraces. Round their lower flanks run old aqueducts, each two or three miles in length. On the downs in the valleys and on the lower flanks of the hills are very many hundreds of stone-lined pits, and, also in the valleys, at every 50 yards, are the most obvious evidences of old occupations, while almost every stone appears to have passed through human hands.

The great extent of country covered with these remains is simply marvellous. They have no similitude whatever to the remains of ancient buildings found in any other part of Rhodesia. In every feature they are altogether dissimilar. (R13)

Hall described one of the forts in

considerable detail, but these facts are not as significant as his overall impression of the fort and associated ruins. He postulated, in effect, that some relatively advanced, unidentified culture was responsible for the skillful design of the multitudinous stone structures in the region, but that the actual construction work was carried out by the indigenous people.

Were these "advanced" and long-forgotten people the same ones who built Great Zimbabwe? We suspect that the answer resides somewhere in the vast ocean of unexamined literature!



This complex of stone walls is typical of the many ancient hillforts in the Inyanga Range in southeastern Zimbabwe. (R13)

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MSF3

The Vitrified Forts of Scotland

Description. In Scotland, the presence of the remains of about 70 stone hilltop forts that have been partially vitrified by the application of intense heat. These structures date from the Seventh Century B.C.

Data Evaluation. Archeologists, long perplexed by the Scottish vitrified forts, have studied them rather intensely since the late 1700s. The professional literature, therefore, is quite extensive. The popular magazines and books have also focused on these forts and have unnecessarily raised the specters of Atlantis and laser-beam weapons. We have ignored the latter genre of sources. Rating: 1.

Anomaly Evaluation. Few investigators doubt that the stone walls of the forts were vitrified by intense wood fires. Modern controversies center on four main scenarios.

(1) The builders of the forts intentionally vitrified the walls in order to strengthen them.

(2) The forts were torched deliberately by attackers.

(3) The forts were overrun and then torched.

(4) The forts were set afire accidentally or deliberately by their defenders after they had served their purpose.

At present, it is impossible to decide among the above four scenarios or others that are offered in the text below. Rating: 2.

Possible Explanations. In addition to the four possibilities offered above, we add the suggestion that the fort defenders may have been forced to retreat from the region of Scotland where the forts existed and in the process adopted a scorched-earth policy.

Similar and Related Phenomena. North American stone forts with vitrified areas (MSF2-X1); the Scottish brochs (MST4-X2); the vitrified Tower of Babel (MST5-X3).

Entries

X0. Introduction and background. Scattered about northeastern and central Scotland, archeologists have located, examined, and speculated about 70 or more stone structures that are popularly called "vitrified forts." Virtually everyone concurs that these particular stone structures were truly "forts" and that they bear the marks of intense, prolonged heat. Except for the fusion of some of their constituent stones, the siting and general design of the vitrified forts are similar to those of the many earthen and unvitrified stone hill-forts in Britain.

Controversy has swirled around the vitrified forts for well over 200 years and simmers still. The chief questions remaining on the table are:

Question #1. Were these forts deliberately vitrified by their builders to strengthen them?

Question #2. Were the forts vitrified instead when an attacking force ignited their external wooden ramparts?

Question #3. Were the forts first overrun by attackers and then torched; that is, fire was not used to subdue the forts?

Question #4. Were the forts accidentally or deliberately burned and vitrified after they had served their purpose and had been abandoned?

To answer such questions, it is necessary to go back in time to the Sixth and Seventh centuries B.C.---the period when radiocarbon dating indicates that the first vitrified forts were constructed. (R13) During this time (the Scottish Late Bronze Age), it was very common

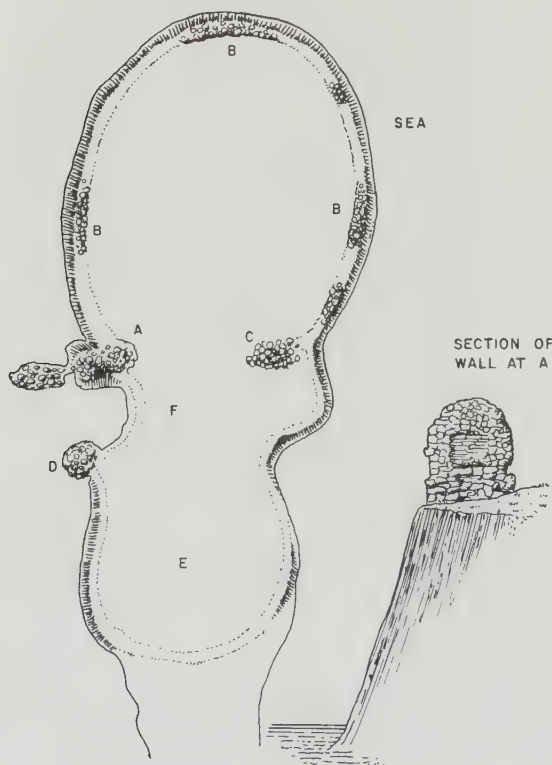
throughout Europe to build stone hill-forts with walls that were internally framed with timber. Often, such forts also possessed external wooden parapets, gates, outwardly facing sharpened poles, etc. The internal framework was intended to stabilize the earth and stone rubble added to the main walls. Only in Scotland, it seems, were fort walls built with cores of pure, dry stone rubble; that is, no dirt. The walls of the Scottish forts, therefore, were full of air spaces and internal, flammable timber that would burn intensely if ignited, especially under windy conditions.

In contrast, similar forts with dirt in the cores of their walls would not burn as fiercely because air would not have circulated freely. Interestingly, France has its "forts vitrifiés," which are also vitrified but to a lesser degree than those of Scotland. (R10, R14) Perhaps their walls contained more dirt.

X1. A representative Scottish vitrified fort. On the west coast of Scotland, north of Moidart, is a deep inlet of the ocean. There, on the flat summit of a promontory, are the remains of a vitrified fort named Arka-Unskel.

The rocks on which this fort is placed are metamorphic gneiss, with indications of trap, covered with grass and ferns, and rise on three sides almost perpendicular for about 110 feet from the sea level. The smooth surface on the top is divided by a slight depression into two portions. On the largest, with precipitous sides to the sea, the chief portion of the fort is situated, and

occupies the whole of the flat surface. It is of somewhat oval form. The circumference is about 200 feet, and the vitrified walls can be traced in its entire length, but at most perceptible at A, B, C, and D. The width of the interior is fifty feet. At one part, A, the vitrified wall is seven feet high and six feet in thickness. At C the wall is three feet three inches high and five feet thick, and so continues through the whole of the walls, although they are not all so high... On excavating at A, below the vitri-



Plan and section of the vitrified fort named Arka-Unskel on the west coast of Scotland. It seems that it would have been very difficult to apply heat externally to the side of the wall facing the sea at A. (R8)

fied wall, we came upon a great mass of large and small boulders, all water-worn, and evidently brought up from the shore to form a foundation upon which the vitrified wall rested. This foundation was three feet deep and five feet across, and rested upon the original gneiss rock.

We dug under the vitrified mass, and there found what was extremely interesting, as throwing some light on the manner in which the fire was applied for the purpose of vitrification. The internal part of the upper or vitrified wall for about a foot or a foot-and-a-half was untouched by the fire, except that some of the flat stones were slightly agglutinated together, and that the stones, all feldspatic, were placed in layers one upon another.

It was evident therefore that a rude foundation of boulder stones was first formed upon the original rock, and then a thick layer of loose, mostly flat stones of feldspatic sand, and of a different kind from those found in the immediate neighborhood, were placed upon this foundation, and then vitrified by heat applied externally. (R8)

This description does not mention but does not necessarily exclude the use of internal wooden framing and other wooden structures. These would have long since rotted away.

X2. The vitrification process. One's initial impulse is to doubt that stones can be fused by wood fires. After all, depending upon the type of rock, temperatures of 1,100-1,300°C are required to produce what is observed in vitrified forts. For this reason, early students of these structures wondered if the vitrification was the consequence of lightning, volcanic activity, or perhaps a heavy application of Greek fire. In this modern age of Star Trek and UFOs, beam weapons on alien spacecraft have been suggested!

Given such unlikely incendiary sources and the intuition that stones would be very difficult to melt in a wooden fire, it made sense to at least try to vitrify representative stone walls in tests using wood fires. This is ex-



*View along one
of the walls of
Knockfarrel, one
of Scotland's
vitrified forts.
(Janet & Colin
Bord, Fortean
Picture Library)*

actly what V.G. Childes did in the 1930s. He demonstrated convincingly that a dry-stone wall with internal timber framework can, given good weather conditions, be ignited and reproduce all of the phenomena seen in the Scottish vitrified forts. (R13, R16) Other experimenters who have tried using only wood placed external to the stone structure have not been as successful as Childes was in duplicating the archeological evidence.

X3. Trying to answer the salient questions. Refer to the questions posed in X0.

Answer #1. The military utility of vitrified fort walls is not obvious. Many

of the walls are only a few feet high and as easily scaled as an unvitrified wall. Vitrification adds little if anything to the military value of the walls. In fact, it is more reasonable to view the vitrified fort walls as the torched remains of much higher, more forbidding, timber-framed walls that were surmounted by wooden ramparts and sharp, wooden stakes pointed toward the advancing foe. Another telling point against the deliberate vitrifying of the forts by its defenders is the fact that most of the stones in the vitrified forts are not vitrified at all! (R13)

The argument is often made that there are too many vitrified forts for vitrification not to have been deliberate acts by the forts' defenders. (R12) This is a shaky argument because the history of warfare tells us that

victorious attackers are invariably very thorough about obliterating their opponents' fortifications. For example, see MST2 in which hundreds of the stone towers in the North American southwest were systematically destroyed.

Answer #2. If the forts employed internal timber-bracing as well as external wooden structures, attackers could well have ignited the forts. Experiments have demonstrated that the application of external heat alone cannot account for the observations of fort remains. (R13)

Answer #3. Since most vitrified forts are rather small---100 feet or so across---the number of defenders was probably rather small, and therefore easily overrun by superior numbers. As indicated in #1 above, captured fortifications are regularly destroyed in warfare.

Answer #4. If, as E.W. MacKie asserts, the forts were not vitrified until after they had served their purpose, the defenders themselves could have deliberately or accidentally torched them. As a matter of fact, the remains of unvitrified, timber-framed forts have been located in Scotland. (R13)

X4. Summary. Even with the "answers" presented above, it is still impossible to chart with certainty the incendiary history of the vitrified forts. Thus, the controversy must continue until more evidence is uncovered.

Since experiments show that the external application of heat was inadequate, the forts must have either been timber-framed internally and not intentionally vitrified by the builders, or that wood was deliberately added internally to the walls before the builders deliberately vitrified their forts. However, some forts do show recesses in the remaining stone structures that probably supported wooden beams, so the former possibility is favored.

The timing of the vitrification is critical to the solution of the vitrified-fort mystery. If, as MacKie holds, they were not vitrified until they were no longer needed, then the erstwhile defenders could have deliberately or accidentally set the fires themselves. Although one

wonders why they would have done so deliberately.

Another possibility not usually discussed has the defenders retreating from the fortified areas under military pressure and applying the well-known "scorched-earth" policy to deny the forts to the assaulting forces. This hypothesis would account for the observed vitrification of so many stone forts in Scotland.

In short, we do not really know if the forts were deliberately or accidentally vitrified; nor do we know who the arsonists were for certain.

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*Part of the wall of Dun Deardail, a
vitrified fort near Glen Nevis, Scotland.
(D. Stacy)*

MSI ANCIENT FURNACES, SMELTERS, HEARTHES

Key to Phenomena

MSI0	Introduction
MSI1	Ohio's Furnace-Like Structures
MSI2	Giant Neolithic Cooking Hearths in Britain and Ireland
MSI3	Evidence for Anomalously Early Iron-Smelting in Subsaharan Africa
MSI4	Innovative Iron-Smelting Technology in Africa

MSI0 Introduction

Manifestly, we cannot claim that the practical use of fire in antiquity is intrinsically anomalous. In our common view of cavemen, we visualize them lighting fires for warmth, cooking, frightening off cave bears, and, a bit later, for assaulting wooden fortresses and destroying an enemy's infrastructure. There are, however, applications of intense heat that do verge on the anomalous.

A milestone in the technological advance of humankind occurred when it was learned how to win metallic iron from its several ores. Innovations and precocious developments in iron-smelting can be anomalous in our view, especially when they took place in unexpected places.

The smelting of gold and silver required relatively low temperatures, as did the production of bronze (copper and tin). Iron-smelting, though, required much higher temperatures, special furnaces, the use of charcoal, and the application of forced air. We have so far identified three phenomena that are anomalous in the sense that they could, or already have, contradicted the accepted history of iron-smelting.

- Precocious smelting of iron (before 1,400 B.C.)
- Iron-smelting in unexpected places at unexpected times in history (in post-Columbian, pre-colonial Ohio)
- Previously unrecognized innovations in iron-smelting technology in Subsaharan Africa.

MSI1

Ohio's Furnace-Like Structures

Description. In southern Ohio, remnants of over 30 pit-shaped structures displaying signs of intense heat and accompanied by charcoal, slag, bricks, and sometimes objects of iron. Radiocarbon dating has produced dates of 1640 A.D. and 1750 A.D., suggesting that these structures are all post-Columbian but earlier than the English colonization of the area.

Data Evaluation. Although we have collected many references, they are predominantly from amateur archeology publications. So far, we have found no serious studies of the Ohio furnace-like structures in the professional literature.

Rating: 2.

Anomaly Evaluation. Two salient anomalies are presented by the Ohio structures:

(1) Their real purpose is uncertain. Amateur opinion favors the theory that the furnace-like structures are just that---specifically, bog-iron smelters. However, the possibility exists that some or all might be lime kilns or crematories.

(2) The builders of the structures have not been positively identified. There are several reasonable possibilities: (a) very early English settlers or colonists; (b) itinerant bands of very early European miners (English or French) who preceded Ohio colonization; (c) Native Americans who independently invented bog-iron smelting or acquired the knowledge from early European contacts; (d) Native Americans who cremated their dead.

In themselves, the uncertainties concerning purpose and and builder identity are not profound anomalies. Only if the Moundbuilders or Vikings can be shown to have smelted iron in Ohio would we have a major anomaly. Our rating applies to all the other, much more likely, possibilities. Rating: 3.

Possible Explanations. See above discussion.

Similar and Related Phenomena. Vitrified areas in North American earthen and stone forts (MSF1, MSF2); Scotland's vitrified forts (MSF3).

Entries

X0. Background. Beginning about 600 B.C. and for about 20 centuries thereafter, southern Ohio was the heart of the Moundbuilder (Hopewell) culture. These enterprising Native Americans are noted for their immense earthen mounds (MSM5 in Ancient Infrastructure), enigmatic earthen "forts" (MSF1), and city-like complexes, such as the one at Newark, Ohio. In this same general area, archeologists---mostly amateurs---have located over 30 sites that display signs of intense heat. One also finds at these spots charcoal, slags, bricks, and pieces of iron. Excavations of these thermally wracked sites reveal what seem to be the remains of old "furnaces" or, in view of the pieces of iron, perhaps, "smelters."

The crucial questions always asked about Ohio's "furnaces" are: Are they truly iron-smelters? Who built them?

With so many Moundbuilder sites in the same region, it is easy to speculate that perhaps the Moundbuilders had precociously learned the art of winning metallic iron from the abundant supplies of bog iron in southern Ohio. Such would indeed be a startling conclusion, because anthropologists are unified in their opinion that Native Americans never smelted iron. All iron artifacts associated with them were either made of meteoric iron or were acquired from early European explorers and settlers.

Central to the "furnace problem" is the dating. If they are pre-Columbian,

the Moundbuilders might be the likely builders, and we would have a first-class anomaly. Just as paradigm-shattering would be proof that the Vikings or other Europeans penetrated beyond the Alleghenies before 1492. If post-Columbian, say, the early 1800s, the earliest settlers of southern Ohio could be blamed. It appears, however, that there are other choices!

At this point, a brief history of southern Ohio is useful. Of course, Native Americans occupied this region until they were pushed out by European colonists in the early 1800s. But the colonists were preceded by French traders and Jesuits in the late 1600s. Coming down from Canada via the Ohio and Allegheny rivers, they paddled far into the lands just west of the Allegheny Mountains. However, there is neither archeological nor historical evidence that the French were ever involved in iron-smelting in southern Ohio.

Actually, the British considered that Ohio belonged to them. It was no other than G. Washington who was sent in 1753 to tell the French to abandon their activities there. Washington's warning was ineffectual. England declared war on France in 1756. At the Treaty of Paris (1763), France gave up all claim to the lands beyond the Alleghenies. (R7)

Still, English colonization of Ohio was slow. Ohio's first historically documented iron furnace was not fired up until 1803 near the border with Pennsylvania. (R15) The point here is that evidence of large-scale iron smelting in southern Ohio much before 1803 would be inconsistent with the history of the state's settlement by the British.

Also pertinent to this story is the nature of so-called "bog iron." This is a variety of limonite found in bogs and swampy areas, where decaying vegetable matter acts upon iron salts to form spongy nodules and sheets of the ore. Although bog iron is contaminated by many impurities, it was an important source of iron for early colonists on the American frontier. Simple furnaces and an abundant supply of hardwood were all that were necessary to extract the iron. In fact, bog-iron smelters are so unsophisticated that the Moundbuilders "might" have hit upon the technique, but there is no convincing evidence that suggests that they did. (R16) The putative Ohio furnaces, therefore, are most probably the work of Europeans. But

which Europeans? Again, dates are essential in solving this "furnace" enigma.

This brings us to A.H. Mallery, who began studying the Ohio furnaces in the late 1940s. Unfortunately, radiometric dating was unavailable to him, and the lack of a firm time frame allowed him to speculate wildly. Mallery was an engineer by profession and best-known in archeological circles for his analysis of the famous Piri Re'is map. (He claimed it revealed an ice-free Antarctica!) It was also Mallery who proclaimed in 1949, much to the discomfort of establishment archeologists, that the Ohio furnace-like structures were really iron smelters. (R1) This was completely unacceptable, and a Smithsonian scientist quickly assured everyone that Mallery's iron smelters were in fact only colonial lime kilns. (R2) Mallery proceeded to make his work even more unpalatable by insisting that it was the Vikings who had built the furnaces and produced iron in North America long before Columbus set sail. (R3, R10)

With such radical notions attached to the Ohio structures, it is no wonder that professional archeologists have given them wide berth. It has been left to the amateurs to ferret out facts, define the anomaly, and frame hypotheses.

X1. Description of the putative furnaces.

A. Mallery was certainly the stimulus for modern research into the Ohio furnaces by a series of amateur archeologists, but he was not the first to notice them. The original discovery (by Europeans) appears to have been made in 1820 by C. Atwater. It happened when the citizens of Circleville, Ohio (named for a circular embankment erected by the Moundbuilders), razed one of the nearby mounds. Investigating the excavation, Atwater was surprised by the presence of charcoal, bricks, and iron, and he so reported in *Archaeologia Americana*. One would expect that E.G. Squier and E.H. Davis, the renowned surveyors of the Moundbuilders' works, would have shown great interest in the Circleville discovery, but they made light of it. (R7)

Additional furnace-like structures were uncovered by F.W. Putnam in the early 1880s. He was at a loss to explain them and settled for calling them "altars." (R7) Putnam's description, however,

does have some features of a crude furnace, but not all of his observations fit the iron-smelter hypothesis.

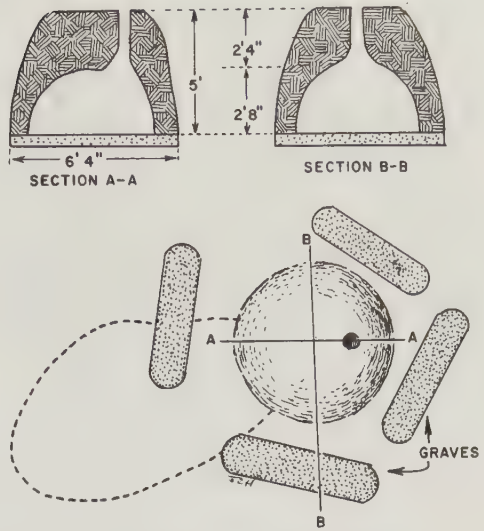
The mound within this [stone wall] was covered by a layer of burnt clay. Under this burnt clay we have discovered a singular series of pits about three feet in diameter and four to nine feet deep. These pits are connected with tunnels or tubes eight feet long and a foot in diameter, having a slight dip downward from the pit and ending in a small vertical tube which extends to the 'concrete' or gravel layer above the burnt clay. The walls of these pits show the effect of great heat and at the bottoms are ashes containing fragments of burnt bones. The long tunnels, or flues as we are inclined to call them, still retain their form perfectly, and on the floor of each is a layer of fine ashes. (As quoted in R9)



Excavation of the Haskins #2 furnace, Ohio. (Clyde E. Keeler)

Furnace-like, yes, but what was the structure's true purpose? No iron nor slag was mentioned by Putnam. The presence of bones suggests that iron-smelting may not have been the main objective of this particular furnace. Was it a crematory? Nevertheless, it is a remarkable Native American structure, whatever it was. Curiously, it reminds us of the heat-fused structures found at Fort Hill, Ohio, and elsewhere. (MSF1)

If the real purpose of the furnace



Plan view and sections of the Allyn Mound "furnace," Ohio. (R8)

described above is uncertain, there are at least 33 other Ohio sites where the evidence for pre-Nineteenth-Century iron smelting is more convincing. The amateur archeologists who have found and explored these enigmatic sites have given them such names as Arledge #1, Haskins #2, Spruce Hill, Deer Creek #2, etc. Usually, the sites have been discovered through erosional features, surface anomalies, and nearby artifacts. The sites are located on the slopes of hills, on the banks of streams, and (suspiciously) inside prehistoric burial mounds. Excavations at these sites have revealed the following features that are diagnostic of crude furnaces.

- Oval-shaped, fire-reddened pits;
- Green-glazed and unglazed rocks along with cinders; i.e., slag;
- Red, baked clay;
- Green-glazed and unglazed red bricks;
- Thermally altered cobbles; and
- Residues of charcoal and lime. (R16)

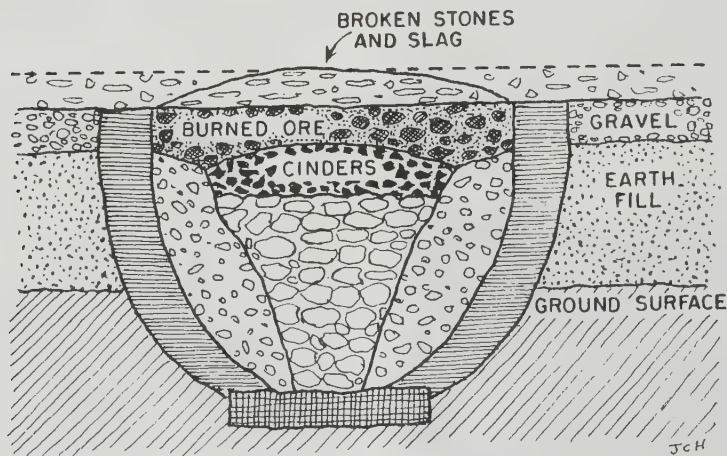
A few such sites have also yielded pieces of iron. For example, at the Haskins site, a 62-pound iron bar and an iron ax head were uncovered. (R5) Such finds are encouraging to those who support the iron-smelter theory, but they are hardly conclusive. The artifacts

could have been left by recent kiln operators, for example.

We have seen no sections through excavated sites that prove they were smelters. This may be because the components listed above were well-mixed or, perhaps, the digs were not well-controlled. We do have, however, a section of what A.H. Mallery supposed the Ohio bog-iron smelters probably looked like. (See sketch.) We should add that Mallery's design may have been slanted by his belief that the Vikings built the Ohio furnaces according to familiar European designs. (R10)

been little local demand for the output of 33 bog-iron furnaces. Of course, one can postulate that a few European entrepreneurs set up camp in the unsettled Ohio wilderness, built 33 smelters, and shipped their production down-river to New Orleans and other more populated areas.

Two additional furnace dates based on the thermoluminescence technique have been published. For the Arledge site, we have 1740 A.D. $\pm$ 17 and 1740 A.D. $\pm$ 25. (R16)



Section of one of the Haskins furnaces in Ohio, as conceived by A.H. Mallery. (Adapted from R10)

Admitting that the Ohio furnace-like might have been smelters, some dates might help clarify the situation. Fortunately, charcoal is a characteristic feature of the sites. C. Keeler had samples from Deer Creek #2 and Haskins #2 carbon-dated. Respectively, the results are: later than 1750 A.D. and 1640 A.D. $\pm$ 90. (R8) These dates are post-Columbian but pre-Colonial for southern Ohio.

The implications are that the Mound-builders had no connection to the furnaces; neither did the Vikings. But, if the furnace-builders were Europeans, we still do not know who they were. Since southern Ohio was very sparsely populated prior to 1750, there would have

X2. Opinions of proponents of the bog-iron-smelter theory. Mainstream archaeologists have demonstrated little interest in the putative Ohio furnace-like structures. In the absence of professional pronouncements, we now present some of the opinions and conclusions expressed by individuals---nonprofessional archaeologists all---who have pursued this engrossing phenomenon.

In 1972, C. Keeler presented, first, the following appraisal of Mallery's work, and, second, his own conclusions as of that date.

As today [1972], more than 21 years later, we probe deeper into the problem of southern Ohio bog-iron fur-

nace mounds, it may be well to examine critically the many claims that Arlington Mallery made in *Lost America*. At the outset we must say that if all his other claims should prove incorrect, at least Mallery must be given credit for insisting that these mysterious structures, found in well-built earthen mounds probably mistaken for Moundbuilder Indian earthworks, were used for smelting bog-iron ore in a primitive fashion supposedly long abandoned by Europeans and any possible European colonists in North America long before the time of Columbus.

Captain Mallery seems to have gone entirely too far when he identified as bog-iron furnaces the "altars" or "crematory basins" in burial mounds uncovered by professional archeologists. This identification, like many

It appears probable that the exploitation was over a period of many years. (R8)

In 1990, under the heading "A Native American Iron Age?" W.D. Conner proffered a more radical opinion.

At this writing I am aware of conflicting evidence, but I am more certain than ever that Native Americans, working long before white settlement, were involved in the origin of some, if not all, of these Ohio high-heat furnaces. The presence of human remains and stone artifacts, as well as geographical relationships and the reports of early visitors to key sites, are my reasons for holding this opinion. (R11)

In 1993, Conner ventured a more temperate opinion.

Contrary to Arlington Mallery's opinion, Arledge Iron Furnace #1 is therefore clearly post-Columbian. Surprisingly, however, it is also pre-Revolutionary, and antedates any permanent European settlement in what is now the State of Ohio. The TL [thermoluminescent] dates indicate either an unrecorded, pre-1763 French settlement, an unauthorized (and therefore unrecorded) English settlement during either the French or English period, or else an American Indian iron-smelting effort. Why the [Arledge] furnace was covered with an earthen mound remains a puzzle, as does the identity of its builders. Perhaps future investigations of these furnaces will shed some light on these issues. (R12)

Once again, some of the supposed iron smelters were found covered by Indian mounds. This has to be a red flag to theorists. Early Europeans would not have covered their furnaces with earthen mounds.

Lastly, in 1995, Conner did not mention Native Americans at all.

In conclusion, what we know about the iron-smelting pit-furnaces today is little more than we knew 50 years ago, until the Lynn Acres excavation. Mallery was correct when he believed these structures represented basic-technology smelting-furnaces,



Iron ax and bar unearthed at the Haskins #1 furnace, Ohio. (Clyde E. Keeler)

of Mallery's other declarations, appears to be supported by no evidence whatsoever.

.....

From our recent studies of bog-iron furnaces, the pattern appears to be emerging is that of a very early iron industry by European colonists who exploited the resources of Ross County [Ohio] at least a century and a half before southern Ohio was permanently settled; but not as far back as the Norse Vikings.

however, practically everything else associated with his investigations are mired in controversy. It is understandable that people have failed to recognize these structures as furnaces. From our modern viewpoint these iron pit-furnaces are odd things. They are little more than piles of ore and charcoal on tops of hills where a brisk wind would make a hot fire.

.....

Until more absolute dates or datable artifacts can be obtained, the enigmatic iron pit-furnaces of south-central Ohio will remain just that---enigmatic. (R16)

References

- R1. Anonymous; "An American 'Iron Age'?" Science News Letter, 56:309, 1949. (X0)
- R2. Anonymous; "Pre-Columbian Furnaces Pronounced Lime Kilns," Science News Letter, 56:395, 1949. (X0)
- R3. Mallery, Arlington H.; Lost America, Columbus, 1951. (X0)
- R4. Keeler, Clyde E., and Kelley, Bennett E.; "Ancient Iron-Smelting Furnaces of Ohio," NEARA Newsletter, 6:28, June 1971. (X1)
- R5. Keeler, Clyde E.; and Kelley, Bennett E.; "Early Iron and the Ohio Furnaces," NEARA Newsletter, 6:52, September 1971. (X1)
- R6. Keeler, Clyde, E.; "Burden of the Amateurs!" NEARA Newsletter, 6:62, December 1971. (X2)
- R7. Keeler, Clyde E., and Kelley, Bennett E.; "Haskins Furnace Mound #2," NEARA Newsletter, 7:2, March 1972. (X0, X1)
- R8. Keeler, Clyde; "A Critique of 'Lost America'," NEARA Newsletter, 7:65, December 1972. (X2)
- R9. Keeler, Clyde E.; "Professor Putnam's Ohio Iron Furnaces," NEARA Journal, 8:14, March 1973. (X1)
- R10. Mallery, Arlington, and Harrison, Mary Roberts; The Rediscovery of Lost America, New York, 1979, pp. 1, 11, 29. (X0, X1)
- R11. Conner, William D.; "Glacial Kame Furnace Site," NEARA Journal, 25:34, Summer/Fall 1990. (X2)
- R12. Conner, William D., et al; "Thermoluminescent Dating of Arledge Furnace #1," NEARA Journal, 28:8, Summer/Fall 1993. (X2)
- R13. Keeler, Clyde E.; "Excavating at Deer Creek Mound, Ohio," Midwestern Epigraphic Journal, 8:19, 1994. (X1)
- R14. Conner, William D.; "Clyde Keeler's Contribution to the Study of Ohio's Earthen Pit Iron Furnaces," Midwestern Epigraphic Journal, 8:25, 1994. (X2)
- R15. Conner, William D.; "Archaeo-Pyrogenics Society's First Full Scale Pit Furnace Fired Up in September," Midwestern Epigraphic Journal, 8:75, 1994. (X0)
- R16. Conner, William D., et al; "The Enigmatic Iron Pit Furnaces of South-Central Ohio," Midwestern Epigraphic Journal, 9:67, 1995. (X0-X2)

MSI2

Giant Neolithic Cooking Hearths

in Britain and Ireland

Description. The frequent occurrence at Neolithic sites in Britain and Ireland of thousands of burnt flint nodules (called "pot-boilers"), which were almost certainly used for boiling water for cooking. It is the scale of this phenomenon that makes it interesting.

Data Evaluation. Our sole reference is a brief report of an excavation at a Neolithic site in Norfolk. Rating: 2.

Anomaly Evaluation. The presence of "thousands" of pot-boilers at multiple locations implies that Neolithic people congregated at large communal kitchens, perhaps in connection of ceremonies or rituals. The massive scale of these gatherings suggested by the great hearths is evidence that Neolithic society was surprisingly populous and well-organized. Such is interesting but scarcely paradigm-shaking. Rating: 3.

Similar and Related Phenomena. The great people-conduits (roads and avenues) of Neolithic Britain (MSH3 and MSR1 in Ancient Infrastructure).

Entry

X1. Remarkable discovery in Norfolk. Britain is home to many collectors of Neolithic artifacts. These amateur archeologists are well-acquainted with burnt flints that are quite common at prehistoric settlements in Britain and Ireland. These lumps of flint are called "pot-boilers" because it is generally agreed that the ancient inhabitants of these islands heated these stones in fires and then dropped them into pots in order to boil water for cooking. This was necessary because the sun-baked pottery of the time could not survive direct contact with fire. Many cultures the world over employed the same cooking technique. This being so, the British pot-boilers would not merit space here if it were not for the fact that they often occur in prodigious numbers in some locations.

The vision arises of giant Neolithic cooking-hearths catering to large social gatherings about which we know little. It is in this unusual social context that we find these hearths so intriguing.

In a 1921 number of *Nature*, N.F. Layard described the excavation of a prehistoric mound in Buckenham Tofts Park, Norfolk. Attention was initially attracted to this spot by a large number of pot-boilers that had been forced to

the surface by moles. Layard's report follows.

Owing to numerous springs taking their rise at a somewhat high level in the park, the old chalk land surface has been carved out by water action into a series of large natural folds, which at first sight might appear artificial. On one of these, where the burnt stones are found in great profusion, we commenced operations, running a trench from the west side up the slope, a distance of 66 ft., and another near the starting point at right angles to it. About 8 ft. from the base of the fold, and in close proximity to a stream, on removing about 3 in. of surface grass and mould, we at once came upon a compact mass of pot-boilers. These continued to a depth of 2½ ft., resting upon blackened earth, which when dug through was found to be lying on the chalk. Tracing the calcined stones from the base of the mound upwards, many thousands came to light, ever decreasing in numbers as they approached the summit, as though thrown out from the spot on which they had been used.

The finding of remains of what

appeared to be a great communal kitchen was extremely puzzling, and only when I got into communication with Mr. Cantrill, of the Jermyn Street Museum, did a possible clue present itself. Mr. Cantrill had published in Arch. Cambrensis accounts of his investigations of similar stone-boiling sites in Wales. His papers also refer to quite a number of these prehistoric cooking places, known as "deer roasts" or "giants' cinders," in Ireland, and I am now informed by Mr. Crawford that they are not unknown in Scotland. In England, Mr. Cantrill tells me, they have never yet been examined.

These accumulations are supposed to have been the large cooking-hearths where the flesh of the red deer or other big game was boiled.

The finding of hollowed tree-trunks in some of these mounds in Ireland suggests that a trough of this kind was sometimes used to contain the water. Mr. Cantrill suggests that another alternative would have been to dig a hole in the chalk and line it with a raw hide to serve as a cooking vessel. To boil such a great amount of water, heated stones in large quantities would have been ladled into the vessel. (R1)

Reference

- R1. Layard, Nina F.; "A Prehistoric Cooking-Place in Norfolk," Nature, 107:623, 1921. (X1)

MSI3 Evidence for Anomalously Early Iron-Smelting in Sub-Saharan Africa

Description. The discovery deep in a Zimbabwe cavern of the remains of what seems to be a primitive iron-smelting furnace. The estimated age this structure, 5,000-6,000 years, is much earlier than the accepted onset of the Iron Age in Sub-Saharan Africa of about 600 B.C.

Data Evaluation. This remarkable discovery was reported in a reliable science magazine, Natural History. We have seen neither refutation nor confirmation in the technical journals. The published date is recognized as highly divergent. However, the cataloging of such data is one of the objectives of this catalog. Rating: 3.

Anomaly Evaluation. The date assigned to this Zimbabwe smelter precedes by a couple millennia the dates of the first iron smelters in the Mediterranean region, where the Iron Age supposedly began. The Zimbabwe smelter is, therefore, highly anomalous. Rating: 1.

Possible Explanation. Given that radiometric dating was unavailable when the Zimbabwe cavern was excavated, the date estimated solely from the site's stratigraphy might be grossly in error.

Similar and Related Phenomena. The unusual iron-smelting method developed in Sub-Saharan Africa (MSI4).

Entries

X0. Background. Archeologists today believe that iron-smelting began in Turkey around 1,600-1,200 B.C. This revolutionary technique spread outward from there, reaching China, Britain, and Sub-Saharan Africa in the first century B.C. However, Sub-Saharan Africa was unusual in that it never experienced a Bronze Age. Rather, the Neolithic was replaced by an Iron Age about 600-400 B.C. This period lasted about a millennium. (R2)

In this historical context, therefore, any evidence of iron-smelting in Sub-Saharan Africa before 600 B.C. would be anomalous.

X1. Report of an excavation. The time was the summer of 1930; the place was Mumbwa in northern Rhodesia (now Zimbabwe). The Italian Scientific Expedition was excavating a cavern that had been used by humans for thousands of years. Quite unexpectedly, the team, which included not only N. del Grande but the famous anthropologist R.A. Dart, came across a remarkable deposit that, if confirmed and firmly dated, would force revision of the history presented above.

N. del Grande reported the discovery as follows:

However, during the excavation, we made a discovery of exceptional interest. It records an extraordinary event in the life of primitive man of that time.

At a depth of more than seven feet from the actual level of the cavern where the earth was rich in stone implements used by prehistoric man, we found about six hundred cubic feet of pure and compressed ashes, hard as rock. A little farther on we brought to light a furnace three feet in diameter, regularly constructed, stone on stone, the inter-

vals filled with earth obviously exposed to violent heat. On one side lay massed a number of unsuccessful fusions and wastes of furnace fire.

Our imaginations drop back five or six thousand years and we see the arrival of strangers. They, too, are primitive men, but happily the possessors of a formidable and miraculous secret. They know how to choose one stone from another and place it with portentous witchery in a great fire. With it they burn other stones, and earth of special quality. Then they stir the first to a brighter blaze and lift it from a seething substance of blinding redness. The mysterious object then grows black, hardens, and becomes pliable. It can be folded and pointed; gradually it is molded into blades, arrows, knives, implements, and ornaments of all kinds. This new substance is iron. (R1)

In the above rather romanticized account, the key words are "five or six thousand years." If these figures are accurate, African iron preceded those pioneering smelting operations in Turkey circa 1,600 B.C. It must be pointed out that radiometric dating was unknown in 1930 and that stratigraphic dating, as used by the Italian Scientific Expedition, has always been hazardous. We must, therefore, regard the discovery outlined above with suspicion.

References

- R1. del Grande, Nino; "Prehistoric Iron-Smelting in Africa," Natural History, 32:531, 1932. (X1)
- R2. Schmidt, Peter R., and Childs, S. Terry; "Ancient African Iron Production," American Scientist, 83:524, 1995. (X0)

MSI4

Innovative Iron-Smelting Technology in Africa

Description. The recent discovery in Sub-Saharan Africa of ancient iron-smelters incorporating technological advances conceived before and independently of European smelting processes.

Data Evaluation. Early African iron-smelters have been examined in depth and even reconstructed by science. Results have been duly published in science journals and magazines. Rating: 1.

Anomaly Evaluation. African iron-smelting had long been considered to have been derived exclusively from Europe, where the Iron Age began earlier than in Sub-Saharan Africa. The overturning of this presumption and the fact that Africans developed some improvements in iron smelting before Europeans did were surprising to mainstream science---to say the least. Rating: 2.

Similar and Related Phenomena. Possible early bog-iron smelters in North America (MSI1); possible iron-smelting in Africa thousands of years before European development of a process (MSI3).

Entries

X1. General observations. The Iron Age in Sub-Saharan Africa extended from roughly 600 B.C. to 600 A.D. Unlike the European metallurgical scenario, which commenced circa 1,600 B.C., it was not preceded by a Bronze Age. These facts and European presumptions led to the belief that African iron-smelting technology was somehow imported from Europe. However, archeological research in the Lake Victoria region has undermined this long-held belief. It now seems that African iron-smelters, although of crude construction, incorporated technical innovations that permitted the production of iron and carbon steel independently of what was transpiring in Europe. (R1-R3)

An early clue that iron-smelting in Africa differed from that invented in Europe came in the 1970s, when it was discovered that slags from African furnaces required higher temperatures to make them flow. In other words, ancient African iron-smelters had operated significantly higher temperatures than those in Europe's sponge-iron bloomery process. Another surprise was the much higher phosphorus content of African iron and steel. (R1, R2)

Archeological investigations of the remains of African furnaces and metallurgical analyses of African iron revealed three innovations:

(1) African iron ore was preheated, allowing the attainment of higher temperatures than in Europe. In fact, preheating was not introduced in Europe until 1828! (R2)

(2) Blowpipes ("tuyeres") attached to goatskin bellows extended deep into the African furnaces.

(3) In some African furnaces, reeds were converted into charcoal. The resulting carbon fibers readily penetrated the molten iron augmenting the production of carbon steel. (R1)

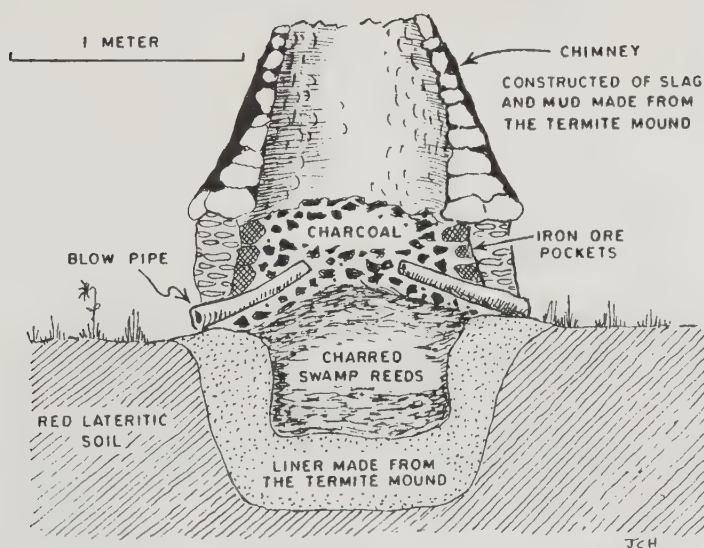
Such archeological research, including the construction and operation of an African furnace (R3), has demolished preconceptions about early Sub-Saharan iron-smelting technology. P. Schmidt and D.H. Avery summarized as follows.

One of the more profound implications of the West Lake [Tanzania] discoveries is that we are now able to say that a technologically superior iron-smelting process developed in Africa more than 1500 years ago. This knowledge will help to change scholarly and popular ideas that technological sophistication developed in Europe but not in Africa. In that respect the ramifications are significant for

the history of Africa and her people.
(R1)

References

- R1. Schmidt, Peter, and Avery, Donald H.; "Complex Iron Smelting and Pre-historic Culture in Tanzania," Science, 201:1085, 1978.
- R2. Schmidt, Peter R., and Childs, S. Terry; "Ancient African Iron Production," American Scientist, 83:524, 1995.
- R3. Van Noten, Francis, and Raymaekers, Jan; "Early Iron Smelting in Central Africa," in The Origins of Technology, p. 64, 1998. Reprint from Scientific American.



An idealized profile of a Haya iron-smelting furnace before the charge of mixed iron ore and charcoal has been added. The iron-ore pockets at the periphery will be roasted for the next smelt. (R1)

MSP PYRAMIDS, ESPECIALLY THE GREAT PYRAMID

Key to Phenomena

MSP0	Introduction
MSP1	Remarkable Stone and Brick Pyramids: A Global Survey
MSP2	Comalcalco's Brick Pyramid and Associated Structures
MSP3	Palenque's Remarkable Temple of the Inscriptions
MSP4	Teotihuacan's Pyramid of the Sun
MSP5	The Great Pyramid: Statistics and General Anomalistics
MSP6	Great Pyramid: Material Processing and Whole-Structure Enigmas
MSP7	Enigmatic Structures within the Great Pyramid
MSP8	The Great Pyramid as an Information Repository

MSP0 Introduction

Ancient pyramids are found on all continents except Antarctica and Australia, and there are even claims that the latter continent possesses one. They come in all sizes (7 feet in height to over 450 feet) and various shapes (squat, soaring, stepped). Some are simple monuments devoid of internal chambers and passages, while others, especially the Great Pyramid, are pierced by multiple passages leading to a variety of chambers.

The ubiquity of pyramidal structures should not be taken as proof of ancient transoceanic diffusion, for, as is often remarked in this chapter, the pyramid is such a simple architectural form that independent invention is nigh inescapable as cultures mature. This said, if pyramids on opposite sides of an ocean share unique and distinctive features, diffusion should at least be considered as a possibility.

Widespread cultural diffusion is only one of the important subjects raised by pyramidal architecture. Here follow additional questions posed by the hundreds of pyramids dotting the inhabited continents.

- How did ancient pyramid builders quarry, transport, lift, and fit together huge, obdurate blocks of stone with their primitive means?
- More amazing---at least to engineers---is the high precision seen in some of

the ancient stone masonry, in the Great Pyramid in particular. How was this accomplished without modern tools and machinery?

- Are the light-and-shadow and acoustical phenomena observed at several pyramids in both the Old and New Worlds intentional or accidental?
- Are transcendental numbers, such as pi, incorporated in some pyramid geometries?
- What were the purposes of the Great Pyramid's strange "air-shafts", its Grand Gallery, and its well-shaft?

To address questions such as these, as well as many of lesser import, we first survey pyramids worldwide, omitting and saving for special attention these four: the brick pyramid at Comalcalco, Mexico; the Temple of the Inscriptions at Palenque, Mexico; the Pyramid of the Sun at Teotihuacan, Mexico; and, of course, the Great Pyramid at Giza, Egypt.

The latter pyramid deserves all the space we assign to it, for it is unquestionably an unparalleled repository of anomalies and curiosities. Even with such intense examination, the Great Pyramid seems to be withholding much from us. Who knows how many chambers remain undiscovered within its immense bulk? And what is behind that mysterious door recently discovered in one of the air-shafts exiting the Queen's Chamber?

MSP1 Remarkable Stone and Brick Pyramids: A Global Survey

Description. Ancient pyramids constructed mainly of stone or brick which are unusual or remarkable for one of more of the dozen reasons listed below under Anomaly Evaluation.

Data Evaluation. The data quality varies wildly from pyramid to pyramid. Some come from popular science magazines over a century old; some from recent eminent science journals. Our data ratings are assigned below for each of the dozen potentially anomalous situations or characteristics. They are the first numbers in the ratings.

Anomaly Ratings. The following pyramid anomalies and curiosities are discussed in this section. The anomaly ratings are the second figures.

- Pyramids observed in improbable geographical locations, such as the sea floor off the North American coast (X1) and some remote Polynesian islands (X8). Ratings: 3/1.
- Pyramids mentioned by early explorers but never rediscovered, as one in the North American west (X1). Ratings: 3/1.

- Pyramids designed to produce unusual acoustical effects, as at Chichen Itza (X2). Ratings: 1/3.
- Pyramids designed to produce light-and-shadow effects at astronomically important dates. Chichen Itza again (X2). Ratings: 1/2.
- Pyramids with distinctive morphologies correlated in the New and Old Worlds. Examples: stylistically similar pyramids in Mesoamerica and Asia (X2/X6). Ratings: 3/1.
- Pyramids constructed from hundreds of millions of sun-dried bricks, as with some pre-Inca Peruvian structures (X3). Ratings: 1/2.
- Large geographical concentrations of pyramids, as in the Sudan (X5). Ratings: 1/3.
- Pyramid characteristics that suggest that some stone blocks were "poured like concrete. Examples: the Giza pyramids (X5). Ratings: 3/1.
- Pyramids with dimensions incorporating pi or other "mystical" numbers, as in the Giza pyramids (X5). Ratings: 2/3.
- Pyramid characteristics that suggest the existence of sophisticated cultures predating the first Egyptian dynasties (X5). Ratings: 3/1.
- Pyramids whose builders and purposes are unknown, as with the Japanese "mini-pyramids" (X6). Ratings: 1/2.
- Pyramids with structural features that seem beyond the engineering capabilities of their builders. Example: the stone roof slabs in one of the subterranean chambers of Khafre's Pyramid (X5-X8). Ratings: 2/2.

Similar and Related Phenomena. Earthen temple mounds (MSM5 in Ancient Infrastructure); the Colmalcalco brick pyramid (MSP2); the Temple of the Inscriptions at Palenque (MSP3); the Pyramid of the Sun at Teotihuacan (MSP4); the Great Pyramid at Giza (MSP5-8).

Entries

X1. North America. Ancient pyramids constructed mainly of stone seem to be nonexistent north of the Mexican border. This is true only if one relies totally upon the scientific literature. In the newspapers and popular magazines, however, we have found several reports of such structures in the United States and off its shores. Extremely questionable though they may be, these reports are engaging and fun to contemplate. They deserve brief mentions, for who knows what observations instigated them?

First, though, we must recognize that flat-topped, pyramidal, earthen mounds are quite common north of Mexico; viz., Monks Mound, the Florida shell mounds, etc. This species of "pyramid" is cataloged in Section MSM in Ancient Infrastructure. In this book, we are con-

cerned only with those constructed mainly of stone.

Here follow several highly suspicious reports of stone pyramids north of Mexico and off North American shores.

Western North America. In 1866 a fascinating, but highly suspect, item was printed in Scientific American. It refers to the explorations of A. von Humboldt, in the early Nineteenth Century, in the regions between the Colorado River and California, where (the item states) traces of an ancient "civilized" culture were noted.

On one of the plains they discovered an object, which, after a tramp of five miles, they reached, and found a pyramid of stone laid in regular

courses and rising over one hundred feet from the plain, the top presenting a surface of fifty feet square. Evidently a portion of the top had been dislodged, either by the hands of men or some convulsion of nature. The courses of stone were from eighteen inches to three feet in thickness, the outer courses cut at an angle corresponding to the inclination of the structure. The abrading action of the elements had so worn the joints that the ascent was a work of but little labor. By whom and when this pyramid was built will probably always remain a mystery. (R1)

It still is a mystery, for we have seen no other mention of this anomalous structure!

Off Vero Beach, Florida. A stair-like pyramid at least 30 feet high in less than 100 feet of water has been reported by A. Conway, a treasure hunter. This purported pyramid's base was said to be 86 feet on a side. Other apparently artificial structures were seen nearby.

Conway first viewed the pyramid from the air in 1985. He dropped a buoy to mark the spot but when he returned by boat, he was unable to relocate it. He spotted it again in 1987. This time, the buoy he dropped got tangled in the plane's stabilizer and the structure was lost again. (R21, source cited: Orlando Sentinel, March 15, 1987)

Vero Beach is on Florida's east coast, not too far from Bimini, in the Bahamas, where several other enigmatic, underwater structures (i.e., a "road") have led to sensational articles in the popular press. These Bahamian structures do exist and have been investigated by mainstream scientists, who are confident that they have a purely natural origin. (MSR3 in Ancient Infrastructure)

South of the Bahamas. An even larger underwater pyramid has been mentioned in a 1978 newspaper item. This one is said to be located some 200 miles south of the Bahamas. Its top is said to be 300 feet beneath the ocean surface. It is stated that a film of this structure shows it to be 150 meters high and 300 meters long. Curiously, it is pierced by holes on each side. A French expedition was reported to be getting ready in 1978 to explore this structure further. (R12)

Expedition results, if any, and the

exact whereabouts of this pyramid are unknown to us.

Note that a pyramid base 300 meters long (about 1,100 feet) greatly exceeds that of the Great Pyramid, whose base measures only 756 feet! This structure might well be a natural one, if it exists at all.

X2. Mesoamerica. Pyramids are so profuse in Mesoamerica that P. Tompkins easily filled his thick book Mysteries of the Mexican Pyramids with the history and features of those pyramids found only in Mexico. There are scores of additional pyramids in Belize, Honduras, and Guatemala. A small handful of these Mesoamerican pyramids exhibit enigmas sufficiently important for us to assign them to separate sections as now noted:

MSP2 The curious brick pyramid called Colmalcalco;

MSP3 Palenque's Temple of the Inscriptions with its singular burial; and

MSP4 The immense Pyramid of the Sun at Teotihuacan.

Two other Mexican structures called "pyramids" of more than usual interest have been classified as "mounds." These are the Cholula and Cuicuilco structures, which are cataloged at MSM5-X2 in Ancient Infrastructures.

As for other stone-built pyramids, they seem to be everywhere in Mesoamerica. Driving along the region's dirt roads, one is sometimes startled to see a nicely formed Mayan pyramid in the middle of a modern pasture. But, after we have segregated the Colmamcalco, Palenque, and Teotihuacan pyramids for special consideration, anomalies are rare in the remainder of this large population of pyramids. We find only five worthy of space in this global survey: the Temple of Kukulcan at Chichen Itza and the four great pyramids at Tikal, Guatemala.

Chichen Itza's Temple of Kukulcan. Now restored, the Temple of Kukulcan is attended by throngs of tourists arriving from resorts at Cancun. A few gingerly climb to the top via a series of 79 ex-



The Temple of Kukulcan at Chichen Itza. The precariously steep steps produce curious shadow and acoustic effects.

tremely steep steps. Actually, it is this series of steps rather than the pyramid itself that is the source of two phenomena that may have been intentionally built into this structure dedicated to Kukulcan, the "plumed serpent," the principal god of the Maya.

The first phenomenon appears precisely at the spring and autumn equinoxes, when the setting sun causes the steps to cast a curious serpent-like shadow on the side of the pyramid. The remarkable aspects of this phenomenon are two in number:

(1) The connection between the snake-like shadow and Kukulcan, the "plumed serpent"; and

(2) The appearance of the shadow at two important astronomical dates; the equinoxes.

It is hard to deny this coincidence and the probability that the Maya deliberately oriented and built the pyramid to achieve this effect. (R13)

The second phenomenon is an acoustical one. If one stands in front of the pyramid's steps and claps one's hands, the echo is a descending bird-like chirp. Specifically, the chirp sounds much like that of the Resplendent Quetzal, a bird revered by the Maya. Although this species is now confined to an area hundreds of miles to the south of Chichen Itza, the builders of Kukulcan's pyramid were well aware of the bird, for its spectacular feathers were a prized Mayan commodity throughout Mesoamerica.

The connection of interest here is that between the quetzal's feathers and the plumes of the "plumed serpent," Kukulcan. This connection becomes more convincing when one learns that Kukul-

can is the Yucatec translation of Quetzalcoatl, meaning "quetzal-bird snake" in the Nahuatl language.

Thus, the serpentine shadow and the quetzal-like chirp may have been architecturally incorporated in a pyramid dedicated to Kukulcan/Quetzalcoatl. (R38, R42)

Incidentally, the chirp-like echo is easily explained by acoustical engineers. Similar acoustical responses can be coaxed from repetitive modern structures, such as an array of bridge girders. The acoustical phenomenon at Kukulcan's pyramid could have been accidental. The Maya may not even have been aware of it. It is more difficult, though, to discount the appearance of that serpentine shadow slithering down the Temple's steps precisely at the equinoxes.

The temples at Tikal, Guatemala. The four Mayan "temples" at Tikal rise majestically above the forest canopy. Tikal, at its height of power (Maya Late Classic, 600-1,000 A.D.) must have been a fantastic complex before the jungle finally swallowed it up.

Temple I, the Temple of the Giant Jaguar, has been largely restored. It is pyramidal, about 45 meters high, with nine superimposed terraces. It and its three companion temples, or pyramids, are distinctly different from most other Mayan pyramids. The sides are exceptionally steep and the tops are strangely "bulbous." (R16)

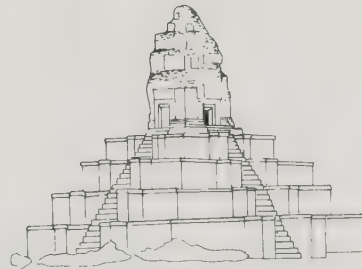
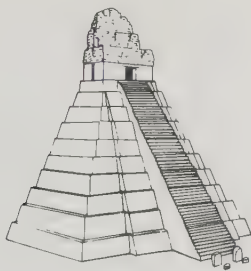
Grand though the four Tikal pyramids are, the justification for their inclusion in this catalog lies not in their size and

shape but in their remarkable similarity to Hindu temples found in southern India.

Diffusionists always claim that the similarity of Mayan pyramids to those of Southeast Asia are proof of early trans-Pacific contacts with the New World. One cannot deny this similarity, but one can also point out that four-sided, stepped pyramids are simple, logical ways to raise a tall, geometrically satisfying structure. Even children playing with blocks make them! The Tikal pyramids, however, with their steep sides and unusual crowns, are different and distinctive. They are remarkably like those Indian temples. If diffusionists insist upon using structural morphology to prove their thesis, they should use Tikal's unusually shaped pyramids---the purported trans-Pacific connection is more convincing in this comparison.

X3. South America. Ordinarily, one does not think of South America as a land of huge pyramids; Egypt and Mexico, yes, but not the Land of the Incas. But pyramids are there by the hundreds, although they were not built by the Incas. (R27)

The area where these neglected pyramids are found is northern Peru, the Moche Valley, in particular, where the Moche Empire thrived before Inca hegemony. It is easy to understand why the Moche pyramids are not featured in TV documentaries. A traveller passing by them today sees only shapeless hills



The temples at Tikal, Guatemala (left) are similar in style to some in India as well as at Angkor Thom, Cambodia (right) (Adapted from R43)



Ruins of a stepped pyramid in the Chicana Valley, Peru.

with few signs of artificiality. But a closer approach and a little digging reveals that these large, nondescript hills are actually composed of untold millions of adobes; i.e., sun-dried bricks. Centuries of weather, even in this usually arid land, have removed most signs of human endeavor. But if one removes the external layers of dirt and debris, one finds immense columns of bricks leaning against one another to form inclined, stepped pyramids.

The largest of the Chimu pyramids is named Huaca del Sol, which is translated (rather loosely) as the Pyramid (or Shrine or Temple) of the Sun. Nearby is a smaller pyramid assigned to the moon (Huaca de la Luna). Although we are concerned mainly with these pyramids here, the Chimu pyramids are usually integrated into large cities or complexes, which are also built mostly from the same innumerable sun-dried bricks.

The Huaca del Sol pyramid is located within the remains of Grand Chimú which, circa 500 A.D., was a truly great city, as described by S.D. Peet.

The ruins at Truxillo, on the plain of Chimú, consist of massive walls, gigantic chambered pyramids, remains of palaces, dwellings, aqueducts, reservoirs, granaries, prisons, furnaces, foundries, and tombs, extending for many miles in every direction. These are the ruins of Grand Chimú, the most extensive and populous of all the

cities of ancient Peru. A league or more from the city was the aqueduct, which was carried across the valley on a lofty embankment more than sixty feet high, built of stones and earth, with a channel on top of the dimensions of our ordinary canals. It was designed to supply the ancient city. Below, stretching away over an area twelve to fifteen miles long, and five or six miles broad, was the plain of Chimú, covered with ruins. They consist of a wilderness of walls, a labyrinth of ruined dwellings, gigantic huacas or pyramids, great masses which the visitor finds it difficult to believe are artificial; terraces cleared of stones, each with its acequia for irrigation, evidently the gardens and pleasure grounds of the ancient inhabitants. Here were two rectangular enclosures, each containing a truncated pyramid. (R5)

At the end of the quotation, Peet was referring to the Pyramids of the Sun and Moon, which are the foci of our attention.

The Pyramid of the Sun is the larger. It rests on a platform 748 feet long and 446 feet wide, the longer dimension being more than 300 feet longer than the base of the Great Pyramid. (R22) The height of the Pyramid of the Sun is difficult to give precisely because of past erosion. E. Guidoni gives it as 159 feet, including its platform.

These are impressive figures, but they pale when one counts the number of

adobes that had to be shaped, dried, and stacked up to make the Pyramid of the Sun: 130 to 150 million. (R11, R22) And most of the city of Grand Chimu and all the other complexes and hundreds of other Chimu pyramids were likewise composed of adobes. The Chimu adobe factories must have manufactured billions of bricks over the centuries of Chimu dominance.

For what purposes were the Pyramids of the Sun and Moon built? To be sure, archeologists have found burials in the



Squier's sketch of a Peruvian Moche pyramid constructed from sun-dried bricks. Obviously, this type of construction has not withstood the elements well. (R44)

Pyramid of the Sun, but this structure also housed people. Apparently, the elite lived on the upper terraces, as evidenced by artifacts, and lower classes below, where excavations revealed crude huts and poor-quality artifacts. In contrast, the Pyramid of the Moon was apparently designated for rituals and ceremonies; no dwellings there, but instead there were richly painted murals of mythological scenes. (R22)

X4. Europe. If you were asked if there were ancient pyramids in Europe, you would instinctively reply "no." The word "pyramid" elicits visions of the Great Pyramid and perhaps the larger of the

Mesoamerican pyramids, like that at Teotihuacan. Yet, there are bona fide pyramids in Europe. While they cannot compete with the Great Pyramid in size and mystery, they are certainly unexpected and curious.

The textbooks rarely mention that the ancient Greeks also built pyramids. In fact, they built two different kinds, neither of which competed in any way with those giant structures across the Mediterranean in Egypt.

The first type of Greek pyramid was not a tomb but rather a water-condenser. The Greeks had learned that piles of porous rocks could, even in desert climes, capture and condense surprisingly large quantities of water from the cool, damp night air. Take, for example, the 13 pyramids of loose limestone rocks that the Greeks constructed some 2500 years ago at Theodosia in the Crimea:

The pyramids averaged nearly 40 feet high and were placed on hills around the city. As wind moved air through the heaps of stone, the day's cycle of rising and falling temperatures caused moisture to condense, run down, and feed a network of clay pipes.

One archaeologist calculated a water flow of 14,400 gallons per pyramid per day, based on the size of the clay pipes leading from each device. (R26)

These pyramidal water-condensers were crude, rather ingenious, and, as pyramids go, unusually practical in terms of the secular needs of their builders.

The second type of Greek pyramid was less utilitarian.

On Greek soil, at Hellenikon and Ligourio west of Athens in the Argolid region, there are two limestone pyramids that are stylistically similar to those at Giza near Cairo. The big difference is size; the Greek pyramids are only the size of a large room compared to the Great Pyramid's height (with capstone) of almost 500 feet. They are hollow and without the mysterious passages and chambers of the Great Pyramid.

When excavations were made around the Greek pyramids in the early 1900s, pottery fragments from the Fourth Century B.C. were found, and it was presumed that the pyramids were also con-

structed then; that is, about the time of Alexander the Great. Recent dating of crystals from internal surfaces of the limestone blocks using thermoluminescence puts the construction times back two millennia. According to this method of dating artifacts, the Hellenikon pyramid dates to 2730 B.C.; that at Ligourio, to 2260 B.C. This would mean that the Greek pyramids were built in roughly the same time frame as the Egyptian pyramids. (R33, R34, R37) These early dates are highly controversial to the historians.

However, these two Greek pyramids are in disrepair with many fallen stones and gaps in the walls. Thermoluminescent dating seems risky under such conditions. It may turn out that the pottery dates (the Fourth Century B.C.) are more realistic.

Why would the ancient Greeks want to build miniature pyramids? The classical scholar Pausanias wrote in the Second Century A.D. that the Hellenikon pyramid was a cenotaph for the dead fallen in a fratricidal battle 4,000 years ago. If the thermoluminescent dating turns

out to be correct, Pausanias might have been right and modern historians wrong.

Menorca, Balearic Islands. The Balearic Islands off the east coast of Spain are the site of many prehistoric, cyclopean towers called "talyots." (MST4) These islands are also the sites of other cyclopean structures that look like over-turned boats. Their shape gives them their name: "navetas." The sterns of these inverted boat-like stone structures are flat. From this end, they look much like the Greek pyramid at Hellenikon. Of course, the other end is pointed. Nevertheless, the overall impression is pyramidal.

The navetas are about 20 feet high. They are cyclopean in style like the contemporaneous talyots but more smoothly dressed. The navetas each contain anterooms, a main chamber, plus a shallow upper chamber. Unlike the talyots, they were evidently not used as refuges for the local populace during strife. Rather, they seem to have been for burials and funeral rites. (R14)



One of Menorca's pyramidal navetas.

Canary Islands. Spain's Canary Islands off the northwest coast of Africa hardly seem a place for pyramids, but there seem to be six of them on Tenerife, near Guimar. The inhabitants of this island have generally ignored these dilapidated piles of black volcanic stones. However, one perceptive native described them in a letter to T. Heyerdahl of Kon Tiki fame and a leading proponent of ancient cultural diffusion across all oceans.

Quick to respond, Heyerdahl visited the Canaries and perceived that amid the rocky debris there were the remains of six stepped pyramids that had been constructed of black stone. He persuaded a Norwegian businessman to buy the site, clean up the debris of centuries, and found a museum.

One of these "black pyramids" has now been restored. But many experts are still not convinced that Heyerdahl has found legitimate pyramids. Perhaps this mainstream reluctance to confirm these structures stems from Heyerdahl's controversial claim that these pyramids bolster his claim that there were age-old cultural links between Mesopotamia, Egypt, Mexico, the Canaries, and even the Pacific Islands! (R40)

Even if we discount the possibility of ancient worldwide cultural diffusion, we still have those unexplained structures of black stone on the Canaries.

X5. Africa. Egypt's Great Pyramid will always be the star in the long lineup of African pyramids. The Great Pyramid has exerted a mesmerizing effect on fringe archeology, resulting in many wild speculations. This is not surprising because the Great Pyramid truly does offer many enigmas and potential anomalies---even to the most conservative student of ancient history. This being so, we have relegated it to four, separate, rather large, sections of our catalog. (MSP5-X8)

Of course, Egypt boasts many other pyramids that also provide much grist for the mills of anomalists. Among these are the Meidum pyramid and the two companions of the Great Pyramid on the Giza plateau. These are discussed later in the present section.

Before trying to come to grips with the manifold structures said to have been raised by the Pharaohs, we must attend to some other African pyramid-like

structures located in Algeria and the Sudan.

Algeria. Bordering the Mediterranean, ancient Algeria shared the megalithic culture we see in Spain, southern France, Italy, and Malta. Some of the Algerian stone arrays and circles are cataloged in MSH5 and MSH16 in Ancient Infra-structure. In addition to these megalithic constructions, there are two sorts of pyramidal structures to be found in Algeria: (1) curious stone structures called "Djedars"; and (2) several large stone mausoleums that are so much like pyramids morphologically that we include them here.

Some of the Djedars are to be found near Tiaret, which is about 50 miles from Mediterranean shores in northern Algeria. L. Playfair described these structures briefly in a report to the British Association in 1889.

The interesting monuments called Djedars are in two groups between Tiaret and Frenda. Their general form is that of a podium, about 30 or 40 metres square, surmounted by a pyramid. They contain intricate passages and sepulchral chambers. In front of each is an isolated platform, probably designed for some religious ceremony, and each was surrounded by a wall, forming a sort of sacred enclosure, probably planted with trees and shrubs. They are situated on the tops of isolated peaks, and are visible from a considerable distance on every side. (R3)

The Djedars are apparently of pre-Roman origin.

In the same report, Playfair mentioned "a curious megalithic city called Mechera Sfa, on the banks of the Mina." Unfortunately, this is all we have found out about this city.

Also said to be pre-Roman are at least two immense pyramidal structures constructed from cut stones and containing galleries and chambers. The largest of these, called Kbour-Roumia by the Arabs, is located about 30 miles from Algiers. It is thought to be the mausoleum of Juba II.

It stands on a high hill in the narrowest part of the Sahel range, and thus dominates the surrounding country. Its form is that of an enormous cylinder resting upon a square founda-

tion and surmounted by a cone-shaped part which is built up of a series of steps reaching to the summit. At the base it measures 197 feet in diameter, and its present height is 102 feet, but it must have been over 120 feet high originally. For the construction, cut stone of large dimensions is used ---disposed in symmetrical order and united by tenons of lead. (R4)

In the Sixteenth and Eighteenth centuries, Arab rulers tried without much success to break into this structure. The first scientific explorations were begun in 1865. After four months of searching and excavating, a tunnel was found that led to a vast gallery. This led to other corridors and rooms. Stone doors that slid up and down in grooves sealed some of the chambers and passages. One vaulted chamber was 16½ feet long, 8 feet wide, and 11 feet high. Inside the structure, the chambers and galleries were built from well-cut stones. The body of the monument consists of rough stone and tufa blocks, joined by a mortar of red or yellow earth. In overall appearance the mausoleum is that of a rounded pyramid.

The internal complexity of this structure is reminiscent of that inside the Great Pyramid which was built built

millennia earlier. Externally, a photograph of this Algerian "pyramid" published in a 1901 issue of Scientific American shows that it lacks the expert masonry of the Egyptian pyramids. Part of the present external disarray probably originated when the lead tenons that stabilized the structure were appropriated and melted down to make bullets.

Sudan. To the south of the land of the Pharaohs, there are more than 230 pyramids built in the Egyptian style. These were constructed as their tombs by the rulers of Kush, the Sudanese kingdom that stretched from Aswan to Sennar on the Blue Nile during the First Century B.C. and which survived up to 350 A.D.

Actually, there are three times as many pyramids in the Sudan than in all of Egypt! Of course, they are much smaller and less mysterious. They are hardly ever mentioned in the archeology books.

Most of the Kushite pyramids form two groups; one near Napata, the first Kush capital, located in the great S-shaped bend the Nile makes in Nubia. The second group is at Meroe (or Merowe) about 150 miles along the Nile north of Khartoum.

The Kush passion for building pyra-



A group of pyramidal tombs at Merowe, Sudan. Egyptian influence was strong here.

mids undoubtedly arose because of this kingdom's conquest of Egypt in the Eighth Century B.C. Kush ruled Egypt until 671 B.C., when they were pushed back into the Sudan by the Assyrians. The Kushites took with them not only a liking for pyramids but also hieroglyphic writing and Egyptian art forms.

The largest of Kushite pyramids are only about one-third the height of the larger Egyptian pyramids. Composed of blocks of dark red sandstone, they are still impressive, even though many have been dismantled for building material. The rulers of Kush kept right on constructing pyramids until the kingdom's demise in 350 A.D., some 2,000 years after the Egyptians had totally abandoned this form of architecture. (R15, R25)

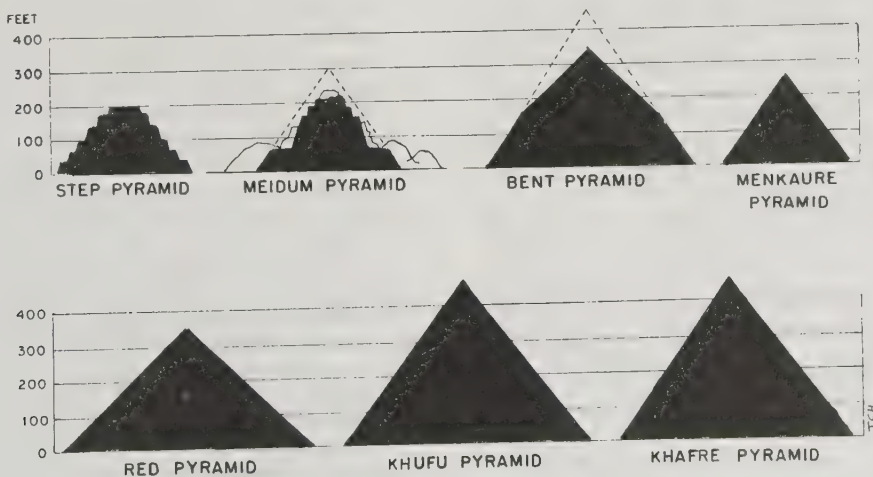
Egypt. Egypt, the land of the Pharaohs, is also recognized popularly as the home of "The Pyramids." In the public mind this usually means just those three large pyramids on the Giza plateau near Cairo. Even more specifically, Khufu's Pyramid, a.k.a. the Great Pyramid or the First Pyramid, is well-fixed in the public mind by innumerable photographs and TV documentaries. But, looking elsewhere in Egypt, one discovers some 80 additional pyramids, far fewer than in the Sudan far to the south, but much older and more impressive. As so often has happened, many of the Egyptian pyramids

have been wholly or largely stripped of their stones for the construction of other edifices.

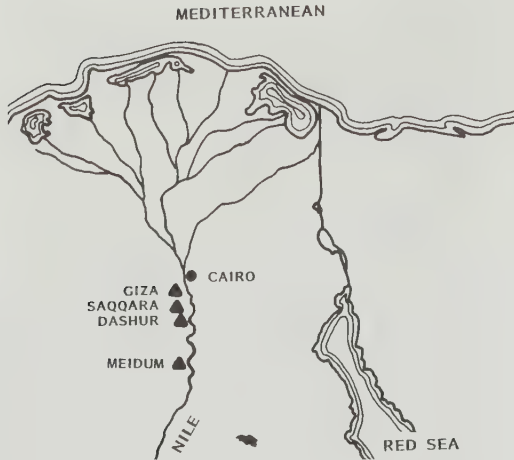
In addition to the three large Giza pyramids, four other Egyptian pyramids are mentioned frequently in the voluminous pyramid literature. Together, these seven prominent pyramids can be strung along a time line to show the evolution of the pyramid idea. This pyramid "family tree" sprouted during the Third Dynasty about 2628 B.C. at Saqqara on the Nile south of Cairo, when Zoser had his engineers and multitudes of workers raise what is now known as the Step Pyramid. The course of pyramid evolution then progressed as follows:

- Zoser's Step Pyramid at Saqqara
- The Meidum Pyramid at Meidum, about 70 miles south of Cairo
- The Bent Pyramid at Dahshur, about 30 miles south of Giza
- The Red Pyramid, also at Dahshur
- Khufu's (Cheop's) Pyramid at Giza (the Great Pyramid)
- Khafre's (Chephren's) Pyramid at Giza (the Second Pyramid)
- Menkaure's (Mykerion's) Pyramid at Giza (the Third Pyramid)

The progenitor of the Egyptian pyramids was the mastaba, which was an oblong, flat-roofed tomb with sloping sides. It was but a short conceptual



A parade of major Egyptian pyramids, illustrating shapes and dimensions. (Redrawn from R9)



The major Egyptian pyramids were sited south of Cairo along the Nile as shown. (Adapted from R43)

advance for Zoser's architects to enlarge a mastaba and build tiers on top of it. The result was the Step Pyramid at Saqqara. Basically, it resembles six progressively smaller mastabas piled on top of one another.

The next large pyramid was located at Meidum. It was evidently was begun



Cross section of a First-Dynasty mastaba, a progenitor of the classical Egyptian pyramids. (R10)

as another step pyramid. But during the construction phase, the plan seems to have been changed to a smooth-sided pyramid with sides rising at an angle with the horizontal of 52° . This angle might have been established simply for aesthetic reasons. However, this 52° angle produces a pyramid with a perimeter equal to 2 pi times its height. The choice of angle, therefore, might have had mystical significance.

The work did not go well at Meidum. Today, the area around the pyramid is a disaster area. According to K. Mendelssohn the 52° angle was too steep for the strength of the materials used and mode of construction. He posits that large sections of the outer part of the Meidum pyramid collapsed creating the piles of rubble we see today. (R9) However, other pyramid experts claim that humans, perhaps looking for building material, rather than gravity and poor design led to the destruction of the Meidum pyramid. Whatever the cause of the massive piles of pyramid debris, the Egyptian engineers apparently went back to their drawing boards when they designed the next pyramid.

The Bent Pyramid, the next in the evolutionary line, was located at Dahshur. It commenced with the "mystical" 52° angle, but one-third of the way to the top, the angle was changed to 43.5° . Mendelssohn speculates that the engineers adopted the shallower angle based on their sad experience at Meidum in order to reduce the stresses on the lower parts of the structure. But it must be mentioned that another theory holds that the angle was changed to accelerate the work for some reason---perhaps the untimely death of the intended occupant of the tomb. In any case, the Bent Pyramid did not collapse and stands to the present day.

Of more than passing interest is the fact that the Bent Pyramid's shallower 43.5° angle leads to a perimeter-to-height ratio of 4 pi. This seems to bolster the theory that the pyramid planners were striving to incorporate certain mathematical verities in pyramid design. The Great Pyramid (Khufu's) seems to be the culmination of this "mystical" imperative, for it seems to incorporate additional mathematical as well as geophysical truths in its design. (MSP8)

Also located at Dahshur, no chances were taken with the Red Pyramid. Its sides were angled at 43.5° from bottom to top. This angle yields a 4-pi ratio, the same as the Pyramid of the Sun in Mexico! This pyramid's name derives from the pink stones that remained showing after its white limestone casing stones were appropriated. In silhouette, the Red Pyramid is rather squat and less attractive aesthetically than the 52° pyramids that followed it.

By the time pyramid construction



The Meidum pyramid. Note the piles of rubble around the base.

began at Giza (about 2,500 B.C.). the Egyptian builders had apparently solved their problems with the 52° angle, for all three Giza pyramids display this sharper angle. Khufu's Pyramid came first, rising to about 480 feet (31 feet of the top are missing today). Khafre's was next and was just a few feet shorter than Khufu's. Finally, Menkaure, who reigned 2,490-2472 B.C., built his diminutive pyramid---only 218 feet high when finished (14 feet now missing). The small stature of the Third Pyramid suggests that perhaps the Egyptian's urge to build pyramids was flagging. Indeed, after the end of the Fourth Dynasty, subsequent Egyptian pyramids were much smaller and rather shabbily built.

There is little to call anomalous in the pre-Giza pyramids. The Egyptian architects and engineers encountered problems and duly solved them. In fact, they solved them very well for those structures not raided for building materials have survived more than four millennia. The only enigmatic aspect of the early pyramids, and of those at Giza, too, is the apparent incorporation of π , that ubiquitous transcendental number, into pyramid geometry. If this was deliberate, it reveals the mathematical sophistication of early Egyptian culture and, more interestingly, the still-present human urge to build major structures to harmonize with mathematical and/or what are perceived to be transcendental

truths. (See MSP8-X1 for more on this possibility.)

These "mystical" characteristics are most prominent in the First Pyramid, the Great Pyramid, that pyramid of Khufu. In fact, this amazing structure taunts us with so many potential anomalies that Sections MSP5-MSP8 are devoted to it. The Second and Third Giza pyramids are not so enigmatic and we can legitimately include them in this global survey of ancient pyramids.

Khafre's Pyramid, the Second Pyramid, brings us face-to-face with two hypotheses from the fringe of archeology that must be attended to, even though they are disdainfully dismissed by mainstream archeologists. These are claims that:

(1) Some of the stone blocks in the Giza pyramids were fabricated artificially; that is, their matrix was "poured" on-site like cement rather than being carved out of distant quarries, dressed, and transported to Giza. (R24) (See MSP6)

(2) The Egyptian culture that raised the Giza pyramids was preceded by a much older, highly advanced culture (related to Osiris) that actually built some of the structures on the Giza plateau, the Sphinx in particular. (R32)

Despite the general ridicule of the "poured-pyramid" theory, both Khafre's Pyramid and the Great Pyramid (MSP5) do pose a few "interesting" observations relevant to this thesis.

J. Davidovits, the champion of the "poured pyramid" hypothesis, is an expert on geopolymeric materials. He has identified four characteristics of Khafre's Pyramid that suggest that some of its stone blocks were made artificially.

(1) From the surface up to the 30th tier, the stone blocks are so uniform in length "that the use of agglomerated stone in the only viable system of pyramid construction."

(2) Some of the stone blocks in Khafre's Pyramid are much less dense (about 20% less dense) than the bedrock limestone; that is, they may not be "natural."

(3) Chunks of stone can be seen in some of the stone blocks, suggesting that they were added when the hypothetical matrix was poured.

(4) The lower courses of Khafre's Pyramid include immense stone blocks 6-10 feet high and weighing as much as 500 tons. Some of these show "lift lines" that are typical of large cement structures that were poured in several stages. The pouring of huge blocks obviously eliminates the problem of transporting them from the quarries. (R24)

Khafre's Pyramid also provides us with an excellent example of Egyptian engineering ingenuity that may also be related to the "poured pyramid" hypothesis.

The south and west faces of Khafra's (sic) pyramid are a mirror image of each other, indicating that the entire intricate design is three dimensional. Successive tiers are made of the same pattern, whereas others are made of different, interrelated patterns. Certain tiers have patterns that are almost the same as those of neighboring tiers. The patterns of other tiers are opposite to those surrounding them. All blocks were cast (sic) according to an uncanny master plan of pattern that eliminated the formation of vertical joints, which would cause weak points. The pyramid resembles an intricate three-dimensional puzzle that was effectively formulated to create an incredibly strong, stable superstructure. (R24)

G. Hancock is a major proponent of the idea that those ancient Egyptians we read about in all the books were preceded by a much older culture. He sees evidence for this in those giant stone blocks comprising the lower 30 feet of Khafre's Pyramid. They are proof, he maintains, that Khafre's Pyramid was constructed in two stages.

In Hancock's view, the first stage of Khafre's pyramid---the lower cyclopean blocks---was the work of the older culture and was, perhaps, a mastaba with the characteristic flat top and slanting sides. Much later, after the demise of this earlier culture, during the Fourth Dynasty, the upper stages of smaller blocks was added. These blocks weighed only 2-3 tons, like most of those in the nearby Great Pyramid. Hancock believes that the cyclopean foundation was built about 10,000 B.C.! (R32) This early date and the supposed culture that wrestled the cyclopean blocks into place

are, of course, not part of the accepted history of ancient Egypt.

The Third Pyramid, that of Menkaure, though small, was solidly built---like those of Khufu and Khafre. Actually, many of its passages and chambers are subterranean and carved out of the solid rock. One of these rock-cut chambers provides us with an tantalizing enigma. This chamber, 12 feet long and 8 wide, is paved with a chocolate-colored granite. The chamber's roof consists of 18 multiton slabs of the same granite. G. Hancock asserts that this room is unique among all the Egyptian pyramids. Its special purpose remains to be explained.

Also puzzling is how the workers brought these heavy stone slabs through the narrow passageways and then raised them to form the chamber's ceiling. There was simply not enough room in the chamber for the number of men that would have been required to raise the massive blocks into place. Modern jacks could do this task, but there is no certain evidence that the Egyptians were familiar with the mechanical advantages available in jacks and block-and-tackle. (R32)

X6. Asia. A rag-tag smorgasbord of stone pyramids is sprinkled about Asia. Most are small and probably recent. A few are Mayan look-alikes, raising again the issue of ancient trans-Pacific cultural diffusion. In addition to these stone structures, there are many very large terraced earthen mounds in China and Japan that are usually referred to as "pyramids." These we have cataloged with other earthen mounds in MSM5 in Ancient Infrastructure,

Russia (Siberia). The following announcement is all we have available on this unusual discovery.

A Russian news agency reports that archaeologists have discovered funeral pyramids in Siberia. The step pyramids found are similar to ones in Latin America and date to the 4th. century B.C. The pyramids were constructed of ceramic plates covered with turf and stone. Two 2,500-year-old mummies have been found in the same region. (R35)

No dimensions were provided. Those "ceramic plates" are interesting in the context of the 500-B.C. date! Obviously, we are short of facts here.

The Maldives. Standing barely above sea level, the nearly 2,000 islands that make up the Maldivian archipelago lie off the tip of the Indian subcontinent.

In his archeological exploration of the Maldives in the 1980s, T. Heyerdahl came across several varieties of stone structures predating the Islamic occupation of the islands in 1153 A.D. (See MSB9-X2 for details.) Among these structures were several pyramids of sorts. These smallish pyramids had long ago been razed by the Moslems and then overwhelmed by the lush jungle. It was difficult for Heyerdahl and his team to discern precisely the style and dimensions of these Maldivian pyramids.

Generally, their sides were precisely oriented to the four compass points. They were faced with quarried (sometimes ornamented) stone blocks. Their cores, however, were filled with sand or coral rubble. Of modest size, the base of one was 10.5 meters long. Like the better-known Mayan pyramids, some of these Maldivian pyramids possessed ramps on each of the four sides. (R20) Once again, the diffusionists have something to support their theories.

Thailand. T. Colvin, while on military duty in Thailand in 1973, photographed a small stone pyramid in a temple complex near the city of Chanthaburi. Colvin estimated the pyramid's height as 20 ± 5 feet. Based upon its architectural style, he surmised that it may have been only 100-300 years old. (R17) This structure resembles the Japanese "mini-pyramids" described below.

Indonesia. During one of his many travels, D.H. Childress tracked down a Mayan-style pyramid called Candi Sukuh reported to exist in central Java. By bus and motorcycle, he finally found the pyramid atop a steep hill.

When I reached the site, I was amazed to see a four-sided Mayan-style pyramid surrounded by numerous statues. The pyramid temple site was located on a knoll of a steep ridge looking out to the west with a panoramic view of the surrounding countryside. A fence encloses the main temple, but

a caretaker let me through the gate.

The pyramid is small---like many Mayan pyramids, it is only about 40 feet high. A stairway on the west side climbs up the stepped terraces to a platform on the top. The pyramid is, in fact, virtually identical to the pyramids found at the ancient Mayan site at Uaxactun, near Tikal. (R29)

The guidebooks insist that Candi Sukuh dates back only to the Fifteenth Century. Childress states that this date is likely erroneous and that 500 B.C. is more accurate, but he does not cite a reference to support this assertion.

A photograph of this Javan pyramid in R29 confirms Childress' claim that it closely matches many pyramids seen in Mesoamerica---ammunition for the diffusionists once more!

Japan. A 1997 number of the Ancient American presents an intriguing photograph of a precisely sculpted pyramid crouching incongruously amid the thick trees and bushes of Mount Kasagi, in north-central Japan. Being only 7 feet high and 14 square, this edifice hardly challenges the classical pyramids of Egypt and Mesoamerica. It is, though, skillfully crafted from solid granite---almost a work of art. Age, sculptors, and purpose seem to be unknown.

The Japanese call it a "trigonon." It is not alone, for four more can be found strung along a ridge on Mount Kasagi about 100 meters apart. (R36)

X7. Australia. The island continent of Australia hardly seems the place to find ancient Egyptian artifacts much less pyramids. Yet, such are the claims of maverick archeologist R. Gilroy. Here follows his description of the infamous Gympie pyramid, as published in the Australasian Post in 1984.

Standing in the bushland some distance from the town of Gympie in southern Queensland, is a crudely-built, 40-metre-tall terraced stone pyramidal structure which, I believe, will one day help to alter the history of Australia---to prove that, 3,000 years ago, joint Egyptian and Phoenician mineral-seeking expeditions



The retaining wall around the Surface Hill Uniting Church, Gympie, Australia. Some claim this is the remnant of an Egyptian pyramid! (R19)

established mining colonies here.
(R18)

According to Gilroy, this purported pyramid boasts 18 recognizable terraces. The bottom 14 terraces are built from rather small stones; but the top four consist of slabs weighing up to 2 tons. Trees as old as 600 years poke up through the stones, attesting to a pre-European origin.

Gilroy's sensational claim that the Gympie pyramid is Egyptian is based upon the purported discovery of artifacts in the Gympie area possessing Egyptian characteristics; i.e., a stone idol resembling a squatting ape, an onyx scarab beetle, and cave paintings with containing Egyptian symbols. Furthermore, aborigine legends tell of "culture heros" arriving on Australian shores in large ships shaped like birds!

Understandably, the thought of ancient Egyptians reaching Australia is anathema to mainstream archeologists. Therefore, it not surprising that a rebuttal of Gilroy's claims soon appeared in science publications. The author of one such rebuttal, T. Wheeler, personally checked out not only the Gympie pyramid but also the other supposedly ancient artifacts said to be found in the Gympie area. He also compiled testimonies from local authorities and from old-timers in neighborhood of the claimed pyramid. His results:

What are we left with? The facts are (probably) that the Gympie 'Golden' pyramid is actually an ordinary hill terraced by early Italian immigrants for viniculture that has been disfigured by erosion and the removal of stone from the retaining walls for use elsewhere. (R23)

Wheeler's conclusion effectively removes the Gympie pyramid from our roster of archeological anomalies. As for the supposed Egyptian artifacts and suggestive paintings, these must be confronted in another catalog volume.

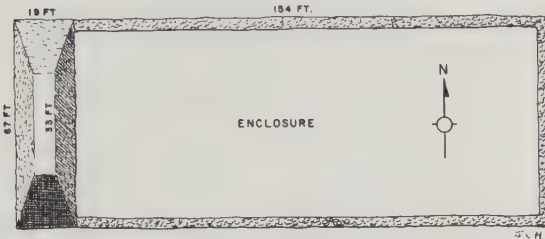
X8. Oceania.

Polynesia. Throughout the thousands of islands that constitute Polynesia, stone structures called "marae" served as ritual sites. Generally, the marae consisted of rectangular walls or platforms plus elevated, multi-tiered structures resembling small pyramids. (R6-R8) See the accompanying sketch.

The Polynesian marae attract our attention on several counts. On occasion, immense stones were maneuvered in place to form the foundations of the marae. Thus the question of transporting multi-ton stones arises once again. Also, some of these marae stones are precision-fit

Inca-style, somewhat like those in one of the Easter Island ahu. (MSW3 in Ancient Infrastructure) Finally, marae are sometimes found on small, remote islands where permanent human habitation would have been unlikely. Why were they placed there?

The point here is that the questions



A typical Polynesian marae in Oceania. The dimensions are modest, but the western section is pyramidal.

posed by the Polynesian marae go beyond the pyramid-like portions of these structures. Because the marae are actually more than pyramids, we have cataloged them in MSB10 along with other enigmatic buildings.

This does not mean that some of the marae pyramids are not impressive as pyramidal forms. For example, marae Mahaiatea on Tahiti rises to a height of 13 meters and includes eleven tiers---hardly a trivial pyramid. (See drawing in MSB10-X2) The similarities of the Polynesian marae and the stepped pyramids of southeast Asia and Mesoamerica cannot be ignored either.

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MSP2

Comalcalco's Brick Pyramid and Associated Structures

Description. At Comalcalco, on Mexico's Gulf Coast, the presence of a Mayan stepped pyramid faced with fired bricks rather than the usual Mayan limestone. Some of Comalcalco's bricks bear inscriptions suggesting an early Roman presence in the New World. Some of Comalcalco's other structures and features support this claim; others are enigmatic in their own right.

Data Evaluation. None of the examined references come from the mainstream science literature. Indeed, Comalcalco seems to have been neglected by the professional archeologists in favor of nearby Palenque. These realities account for

the relatively low data evaluations given below (the first figures in the ratings).

Anomaly Evaluation. Observations in support of a Roman or other Old World Precolumbian contact at Comalcalco would be highly anomalous. This is reflected in the anomaly ratings below (the second figures). Comalcalco also harbors other puzzles that are unrelated to diffusionism; these are also evaluated below.

- Fired bricks inscribed with Roman-style symbols, crosses, and possibly a Punic calendar (X3). Ratings: 3/1.
- Buildings and other structures that deviate markedly from the typical Mayan style (X4). Ratings: 1/2.
- "Erratic" mounds with brick facings (X5). Ratings: 2/3.
- Human burials in jars in a style unique to Mesoamerica (X6). Ratings: 2/2.
- Inscribed bricks apparently buried ceremonially (X7). Ratings: 2/2.
- Dimensions of bricks and other objects reflecting Roman units of measure (X8). Ratings: 3/2.
- The unique use of cement similar to that favored by the Romans (X9). Ratings: 3/2.
- The absence of the ball court so typical of Mayan sites (X10). Ratings: 1/3.
- A Roman-like ceramic head with a beard and mustache (X11). Ratings: 2/2.
- Conflicting dates for the bricks and site-in-general (X12). Ratings: 3/1.

Possible Explanations. A Roman Precolumbian contact at Comalcalco is certainly not out of the question. The Romans had seaworthy ships and the Atlantic currents favor crossings to the Caribbean area and Gulf of Mexico.

Similar and Related Phenomena. Other archeological hints of Roman landings in the New World: Roman coins (MGC); the Calixtlahuaca carved head (MGT); legends of Precolumbian white visitors to Mexico (MAM); reports of Roman amphorae in Brazil (MMP). All of these subjects are cataloged in other volumes in the M-Series.

Entries

X1. Background and a radical hypothesis. The Mayan archeological site called Comalcalco is now located about 15 kilometers from Mexico's Gulf Coast. The village of Comalcalco is farther inland some 10 kilometers southwest of the ruins. During Mayan ascendancy, Comalcalco (the archeological site) was directly accessible from the Gulf, but due to the gradual rise of this part of the coast, it is now landlocked.

Another geographical fact of significance is Comalcalco's 100-kilometer distance from useful building stone. In consequence, when Comalcalco was built, its pyramids, its temples, its curious mounds, and other structures were built

of bricks made from sand, clay, and other local materials. In fact, there may be a million or more fired bricks in the Comalcalco structures, most of which remain unexcavated. The ubiquitous bricks at Comalcalco were usually used as facings replacing the usual limestone typical of Mayan sites. Thus, Comalcalco, though manifestly Mayan, is superficially different.

The use of fired bricks by the Maya is not anomalous in itself---there are other Mayan sites nearby that also employ fired-brick facings. A potential anomaly appears only when the Comalcalco bricks are excavated and the cement stripped off. Some are inscribed



The Mayan pyramid at Comalcalco was constructed from fired bricks rather than the usual stone.

with marks that resemble those used by bricklayers in the heyday of the Roman Empire. Incised crosses are sometimes found. It is these bricks that have led to a hypothesis that is unacceptable to mainstream archeology: that the building of Comalcalco was strongly influenced by contact with Roman visitors between 1 A.D. and 300 A.D.

Can a few scratched bricks overturn that fundamental archeological paradigm that admits no Precolumbian contact with Mesoamerica? Perhaps not, but when the several other unusual, highly suggestive features of Comalcalco are added to the archeological stew, a surprisingly good case for revising that paradigm can be made.

Even if a Roman influence cannot be proven, Comalcalco is so unusual as Mayan sites go that we cannot avoid cataloging its idiosyncracies.

The idiosyncracies and potential anomalies are at least ten in number. These we have listed above under Anomaly Evaluation.

X2. Excavations and investigations at Comalcalco. With so many interesting problems residing at Comalcalco, one would expect the site to have been studied and written about in great de-

tail. In fact, the professional, English-language literature on Comalcalco is sparse indeed. The site has been visited and surveyed cursorily for over a century. Apparently, the first inscribed bricks were found by a surveying team from Tulane in the 1960s. The first major mapping effort and architectural study was conducted in 1966 by a team from the University of Oregon led by G.F. Andrews. His "architectonic survey" of Comalcalco was published in 1967. In 1989, this report was revised and updated. To this day, this report seems to be the only intensive archeological study of Comalcalco in print.

The most ambitious excavations at the site were directed by Mexican archeologist P. Salazar in the 1970s. Salazar's group unearthed seven temples, a so-called "palace," and several of the strange "erratic" mounds. Unfortunately, Salazar's work has not been published---at least not in English.

It was during Salazar's excavations at Comalcalco that N. Steede became involved with the site and, especially, the inscribed bricks. Steede was a key figure in a project that photographed over 3,600 of these potentially anomalous inscribed bricks.

As one can see from our references at the end of this section, Steede has been a moving force in promulgating the mysteries hovering around Comalcalco. It

is also apparent from our references that we have had to rely upon what mainstream archeologists call "fringe" literature---or worse! The mainstream texts at our disposal barely mention Comalcalco, and they certainly avoid the ten potential anomalies cited at the beginning of this survey of the Comalcalco "problem."

With these introductory and cautionary paragraphs, we now systematically tackle the ten Comalcalco enigmas that we have culled from our files---there may be others.

X3. The inscribed bricks. The case for early European contact at Comalcalco depends heavily upon the inscribed bricks. There is no shortage of these; almost 5,000 have been photographed. Since only 2-3% of the site has been excavated, many more inscriptions are doubtless still hidden behind cement in the unexplored parts of Comalcalco.

The bricks themselves are otherwise undistinguished. They vary in size from 1 x 2 x 4 inches to 2½ x 22 x 31 inches. Some are nicely molded; others crudely hand-formed. Local sand and clay are the basic ingredients. Apparently, the bricks were first sun-dried and then fired. Firing was uneven, ranging from scorched bricks to those barely fired. Their number is large: hundreds of thousands surely, perhaps more than a million fired bricks throughout the site.

Most of the inscriptions are simple signs, geometric figures, doodles. (See figure.) A few depict animals, plants, humans, ships, temples, etc. Mayan hieroglyphs occur for certain. B. Fell

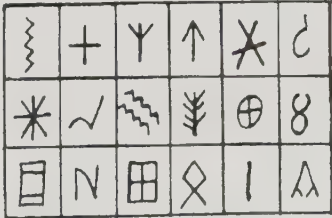
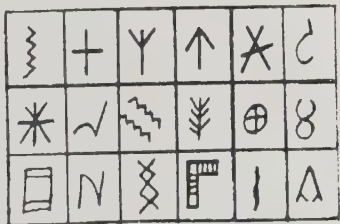
has claimed that some inscriptions are from the Old World, and that there is even a Punic calendar represented. (R3) However, doubts have been cast upon some of Fell's identifications and translations. (R6)

There is no doubt, however, that some of the masons' marks resemble very closely those favored by Roman masons. D.J. Eccott, who is otherwise skeptical about the claims of cultural diffusion, was impelled to write as follows.

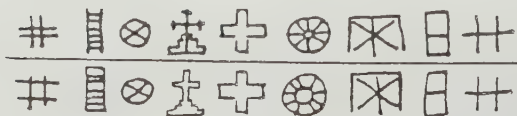
Some of the signs which occur on fired Roman tegulae (brick roof tiles) are found only in the British Isles (notably, at the remains of as Roman brickyard at Baufort Park, East Sussex). These exactly match the signs found on some of the Comalcalco bricks! (R5)

Also strongly suggestive is the frequent appearance of the Greek cross on Comalcalco bricks. Crosses are exceedingly rare elsewhere in Mayaland. In fact, crosses are easily the most common symbol on the 4,600+ photographed bricks, numbering almost 200. One Comalcalco brick bears the distinctive Cross Calvary (a Latin cross mounted on three steps). These crosses and the remarkable similarities between the Comalcalco and Roman masons' marks permitted N. Steede to comment:

The illustrated bricks of Comalcalco are pieces to a grand puzzle, whose completed, final image may reveal a Roman Christian presence in the Americas a thousand years before the arrival of Columbus. (R4)



Mason marks seen on Comalcalco's bricks (left) strongly resemble those used by Roman masons (right). (R5)



Christian motifs common in ancient Europe (top) are similar to motifs at Comalcalco (bottom). (R3)

X4. Non-Mayan innuendoes in Comalcalco architecture. Visitors to Comalcalco recognize it as Mayan but cannot escape the feeling that there is something very different about it. D.J. Eccott expressed it this way:

Indeed, one is left with the distinct impression that one is viewing typical Mayan edifices built by employing Old World construction techniques. But this impression is, in all probability, purely illusory. (R5)

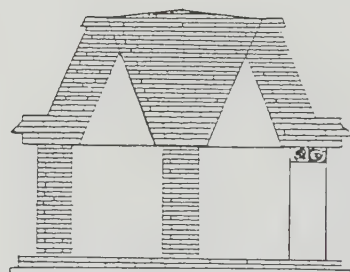
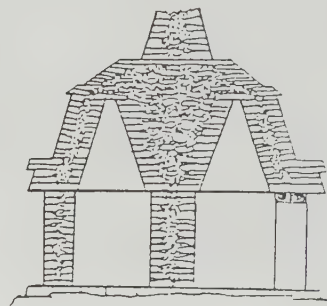
Eccott was reassured that there could not have been any Old World contacts at Comalcalco because the site's arches are typically Mayan; that is, corbelled. If the Romans had visited Comalcalco, they would surely have introduced the Roman arch seen all over their Empire.

This said, Eccott has to admit that the Comalcalco arches do differ from other Mayan arches. Instead of terminating in a flat capstone, the Comalcalco arches come to a sharp point. He also identifies other Comalcalco architectural anomalies: the erratic mounds (X5), the un-Mayan absence of a ball court (X10), and the presence of narrow windows, which are extremely rare in Mayan structures. (R5)

L.F. Athy, Jr., adds to the dossier of Comalcalco architectural anomalies. Topping his list, it goes without saying, is the use of fired bricks joined by mortar. Additionally, the Comalcalco structures are mostly courses of solid brick. The interior rubble fill so common in Mayan buildings is virtually nonexistent at Comalcalco. (R2)

Of course, none of the forgoing features prove an early Roman influence at Comalcalco. The discovery of a Roman coin or two would be much more convincing. N. Steede, however, has sought to advance the theory of Roman contact by tabulating 25 characteristics

of the Comalcalco bricks and asking if the brickmakers in any other Old World cultures duplicated them in their brick-yards. Steede determined that only Roman bricks closely matched those seen at Comalcalco, with those of Carthage a close second. (R6)



Comalcalco's structures avoid the rubble fill so common at other Mayan sites. Compare the corbelled vault from Palenque (top) to a similar structure from Comalcalco (bottom). (R2)

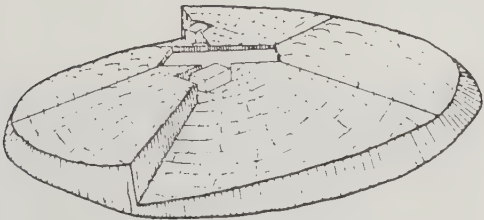
X5. Comalcalco's "erratic mounds". Both G.F. Andrews and N. Steede have directed attention to so-called "erratic mounds" at Comalcalco. Judging from drawings provided by Steede, the adjective "erratic" is well-justified. The shapes of these brick structures cannot be described by any common geometrical shape that we know of. (See figures.) Some investigators have surmised that they might have been intended to portray geometrical concepts; but, seeing that they are "enigmatic" to us today with all of our topographic insights, we

suspect that the Maya had something less abstruse in mind than the display of geometrical truths.

Steede counted six erratic mounds, but there may be more, for Comalcalco has not been thoroughly excavated. In fact, the mounds themselves apparently still remain unexcavated. These mounds are characterized as "low", but we have seen no specific dimensions. (R1, R2)

The erratic mounds seem to be unique in Mayan architecture. They deepen the mystery surrounding Comalcalco.

Perhaps pertinent here are the many "erratic" carved stones left behind by the Inca, such as those at Concacha, Peru, and El Fuerte, Bolivia. (See MSO in Ancient Infrastructure.) We do not know why the Inca carved their weird shapes either.



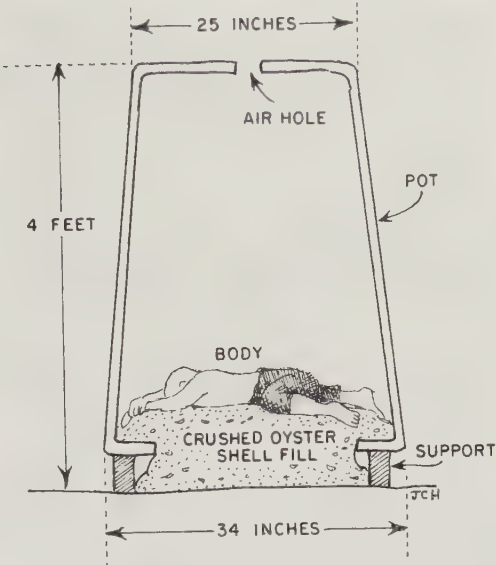
One of Comalcalco's "erratic" mounds. (R1)

X6. Comalcalco's unusual burials. Like so many of the architectural features of Comalcalco, the burials at this site not only differ substantially from typical Mayan practice but also invite positive Old World comparisons.

Comalcalco corpses, at least those of the elite, were placed face down in a fetal position upon a bed of oyster shells, and then covered with an inverted pot whose top was pierced by a hole. Except for their sizes, these pots resemble modern flower pots. (R1)

N. Steede asserts that this type of burial is unique in the New World but is not unlike some in the Etruscan world. He concluded as follows.

So, it can be demonstrated that Comalcalco tombs are very similar to

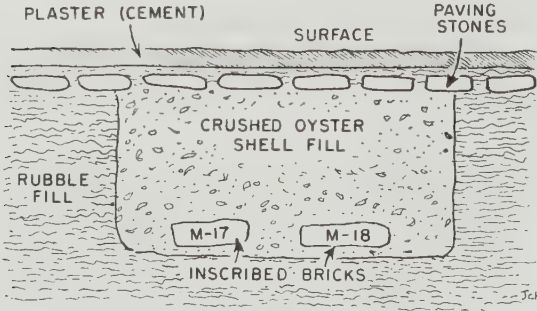


Some burials at Comalcalco depart from the usual Mayan practice. Instead, they suggest a Mediterranean influence. (R1)

constructions found in the Mediterranean. They are similar in their form and orientation, and identical in measurement. And yet, they have not been found at any other site, to date, in Mesoamerica. (R6)

X7. Ceremonially buried bricks. Almost as strange as the erratic mounds are two fired bricks found buried under the pavement of the walkway to the main plaza located in front of the main Comalcalco pyramid (Temple I). These bricks had been placed in a special pit filled with crushed oyster shells. They apparently bear no inscriptions and differ little from the bricks from which much of Comalcalco was constructed. However, because of their bed of oyster shells (like those in the pot burials), it is assumed that these particular bricks had some special significance to the Maya and were interred ceremonially. (R1)

A third brick was found at the feet of the skeleton in the tomb at the top of the main Comalcalco pyramid (Temple I). Were the three bricks connected in any way? We'll never know for certain.



Curiously, the Maya ceremonially buried bricks at Comalcalco. (R1)

One can speculate further that the two buried bricks might have been involved in a ceremony in which the pyramid was dedicated or consecrated. A cogent comparison would be the ceremonial laying of cornerstones or symbolic bricks in modern structures by politicians!

X8. Comalcalco units of measure. N. Steede states that the Comalcalco bricks come in at least ten basic sizes and that their dimensions conform to the Roman system of feet and inches rather than the Mayan standard unit of length (about 18 inches long). This quantization of dimensions is very common in the molded and cut bricks, but rarer in those that were hand-molded. Furthermore, some bricks bear measuring marks that are also compatible with Roman units of measure. (R6)

One should be skeptical about "proofs" of cultural diffusion based upon units of measure. Fudging is easy. So is misinterpretation when a structure contains hundreds of thousands of bricks of many different sizes.

In this context, we recall the many arguments pro and con over the existence of a "megalithic yard" that was supposedly used to lay out Neolithic stone circles and other European structures. (MSH9 in Ancient Infrastructure)

X9. The use of Roman-style mortar. According to N. Steede, the mortar and stucco employed at Comalcalco is superior to that found at other Mayan sites. It is, he says, similar to that used in the Mediterranean in the First Century A.D. Furthermore, Comalcalco's superior cement seems to have appeared suddenly with no evidence of evolution from older Mayan sites. In other words, it appears to have been introduced from elsewhere. (R6)

X10. Comalcalco lacks the usual Mayan ball court. Negatives do not prove much, but it is certainly odd that Comalcalco does not have the obligatory ball court seen in other major Mayan complexes. (R5)

X11. Comalcalco's Romanesque ceramic head. It is strange that only one of our references mentions this art object with human features and a style that clearly speaks of a Mediterranean origin. Even N. Steede, a strong proponent of Roman influence at Comalcalco, fails to remark on it. Perhaps it was not discovered



This ceramic head recovered at Comalcalco suggests a Roman influence. (R5)

professionally; that would diminish its archeological value. In any case, D.J. Eccott comments as follows.

In the museum at Comalcalco can be seen a beautifully carved ceramic, finely preserved, depicting the head of a man shamelessly sporting a moustache and neatly trimmed beard which, one could be forgiven for conjecturing typifies a Roman style. (R5)

Eccott adds that a comparable head was professionally excavated from a truncated pyramid at Calixtlahuaca in 1933. Thermoluminescent dating placed this particular head at 200 A.D. (R5) It must be added, however, that the sample provided for thermoluminescent dating consisted of a small bit of powder drilled from the head. Large probable errors attend such measurements.

X12. Comalcalco's conflicting dates.

Mainstream archeologists hold that the fired-brick structures at Comalcalco were raised late in this site's history, probably after the fall of Palenque, which occurred circa 800 A.D. Actually, one of Comalcalco's inscribed bricks bears the date 734 A.D. (or 803 A.D. according to different experts). These dates are reasonable because Comalcalco's architectural style (omitting the bricks) does resemble that at Palenque. (R5)

Comalcalco, therefore, according to the professionals was likely built between 800 and 1,200 A.D.---much too late for the purported Roman influence.

Nevertheless, despite these professional reassurances that Comalcalco is purely Mayan and relatively recent at that, one does have a nagging feeling that all of Comalcalco's idiosyncracies are not easily disposed of.

N. Steede rejects the mainstream dates. He asserts, first, that the hieroglyphics on the Comalcalco bricks are simpler than those at Palenque and, therefore, older. He assigns them to the First and Second Centuries A.D., as would be reasonable for an early Roman contact in the New World. Steede also cites a radiocarbon date of $1,620 \pm 50$ B.P. for a sample of mortar taken from Comalcalco. Obsidian dates, too, Steede maintains, suggest Comalcalco construction during the First and Second

Centuries A.D., perhaps even earlier. (R6)

Only further research will dispose of these stark contradictions.

X13. Conclusion. If Roman ships had ridden the same ocean currents that propelled Columbus, they might well have ended up in the southern Gulf of Mexico near Comalcalco. The Romans could have been there, but Comalcalco does not prove conclusively that they were. The total impression presented by the ruins at Comalcalco is that the site is undeniably Mayan in concept but seems to have been subjected to some degree of Old World influence. Perhaps this "alien" aura was accidentally produced by the Maya themselves, but it also could have been introduced by early Old World Atlantic crossings contrary to prevailing paradigms.

References

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- R2. Athy, Lawrence F., Jr.; "Tulan Zuiva = Comalcalco," Epigraphic Society, Occasional Publications, 18:160, 1989. (X3-X5)
- R3. Fell, Barry; "The Comalcalco Bricks: Part 1, the Roman Phase," Epigraphic Society, Occasional Publications, 19:299, 1990. (X3)
- R4. Steede, Neil; "The Bricks of Comalcalco," Ancient American, #7:8, 1994. (X3)
- R5. Eccott, David J.; "Comalcalco: Maya Innovation or Old World Intervention?" Ancient American, #24:8, 1998. (X3, X4, X10-X12)
- R6. Steede, Neil; "Comalcalco: An Early Classic Maya Site," in Across before Columbus, Donald Y. Gilmore, ed., Edgecomb, 1998, p. 35. (X3, X4, X6, X8, X9, X11)

MSP3**Palenque's Remarkable Temple of the Inscriptions**

Description. Architectural and graphic features at the Mayan site of Palenque, particularly at the stepped pyramid called the "Temple of the Inscriptions", that suggest Precolumbian Old World contacts with Mesoamerica.

Data Evaluation. Palenque is one of the most thoroughly studied of all Mayan centers. The features cited below are well-documented; it is their interpretation that is at issue. The data evaluations are the first figures in the ratings.

Anomaly Evaluation. Three potential anomalies at Palenque have been selected for cataloging. Of this trio, the similarity in the use of the lotus motif in both the Old and New Worlds seems to place the strongly defended "no-diffusion" paradigm at most risk. The anomaly evaluations are the second figures in the ratings.

- Within the Temple of the Inscriptions, the style of architecture and the graphic artifacts are so similar to those in some of the Egyptian pyramids that ancient cultural diffusion is suggested (X2). Ratings: 3/1.
- The use of the lotus motif at Palenque is highly specific and virtually identical to that in Hindu and Buddhist temples. Here, more recent cultural diffusion is claimed (X3). Ratings: 2/1.
- Ancient Egyptian rather than Mayan units of measure seem to have been used in laying out the Temple of the Inscriptions. Diffusion implied again (X4). Ratings: 3/1.

Possible Explanation. Precolumbian contacts by Egyptian and/or Oriental voyagers.

Similar and Related Phenomena. Purported Precolumbian Roman influence at Comalcalco (MSP2); Chinese characters on Olmec artifacts (MGW in another volume); similarities between Mayan pyramids and some in southern India (MSP1).

Entries

X1. Background and Oriental innuendoes. Palenque is situated some 100 miles south-east of Comalcalco (MSP2) in the Mexican state of Chiapas. The glory days of Palenque were from 300-900 A.D. It is representative of the Classic Period of the Maya, whereas Comalcalco is post-Classic. In contrast to Comalcalco, Palenque has been well-explored by archeology professionals. It is probably the most famous of all Mayan sites. Ever since Spanish adventurers "discovered" Palenque in 1750, it has been a popular destination for tourists and scientists alike.

There is and has been plenty of work for archeologists at Palenque. The pyramids (or "temples"), palaces, towers, and other structures stretch for several miles along a high ridge. More than 500 structures and mounds, some still choked

by vegetation, have been counted in an area of 15 square miles. (R3) Unquestionably, Palenque's pyramids and other edifices must be judged magnificent in their sizes, numbers, and architecture. Happily for the anomalist, several enticing enigmas are also found at Palenque.

Palenque is not just one more impressive collection of Mayan ruins. It is subtly different. While Comalcalco had a (perhaps illusory) Mediterranean cast, Palenque seems to display a touch of the Orient and perhaps even Egypt! The French artist F. de Waldeck, who lived at Palenque 1832-1834, thought he saw elephant heads among the Mayan glyphs. Other early explorers of the site saw the influence of the Pharaohs! (R2) Of course they were mistaken, or were they?

It is at Palenque's Temple of the Inscriptions that these supposed Old

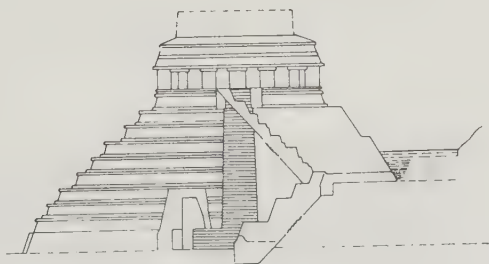
World influences seem to peak. This stepped pyramid is named for its 620 sculpted glyphs. This exceptionally large collection of glyphs does not relate anything anomalous. Rather, the enigmas involve the pyramid's architecture and dimensions and, especially, some of the bas reliefs that decorate it and nearby structures. We single out for further discussion the three features of this pyramid and Palenque-in-general that are listed above under Anomaly Evaluation.

X2. Egyptian innuendoes in Palenque architecture. Diffusionists often assert that the Maya acquired the "pyramid idea" from the Old World, probably either from Egypt or the Orient. Such claims are usually rejected on the basis that the Old World pyramids were built as tombs whereas the Mayan pyramids were simply platforms for the temples that crown them. The Temple of the Inscriptions at Palenque belies this contention. It alone among all Mayan pyramids contains a tomb deep inside its steeply stepped sides. It is a rich tomb, too, and replete with unusual features that further differentiate it from other Mayan pyramids. (R2)

It is not the interment of a Mayan ruler in the Temple of the Inscriptions that raises suspicions of Egyptian influence, it is the architecture that envelops the burial. Admittedly, the Temple of the Inscriptions does not compare size-wise with the large Giza pyramids. It is only 52 feet high. (R2) On the outside, it is a typical Mayan stepped pyramid topped by a temple. Until 1949 this is exactly what everyone thought the Temple of the Inscriptions was. The significant differences are all internal.

First of all, the temple floor is not the usual stucco laid down by the Mayan builders; instead, it is composed of enormous flagstones, all neatly finished and fitted. In 1949, Alberto Ruz Lhuillier (usually referred to as "Ruz"), from Mexico's National University, suspected that perhaps something besides rubble-fill lay beneath these atypical flagstones. Under them, he discovered a staircase leading down into the pyramid's interior. The stairway was in perfect condition but it had been intention-

ally blocked by large stones. In the early 1950s, Ruz and his team laboriously cleared the passageway and found that it made a double turn, leading the excavators to the very center of the pyramid some 65 feet below the temple floor. By the fourth year of the dig, they had reached a formidable wall. After much effort, the wall was breached. Ruz was amazed to find an enormous room, all of 23 feet high, with a floor area 13 x 29 feet. This vault was roofed by huge stone beams somewhat reminiscent of the King's Chamber in the Great Pyramid. All around, the walls were covered with bas reliefs. Occupying most of the vault was what seemed to be an altar covered with glyphs and carvings of astronomical signs, human heads, and typical Mayan motifs. It bore two dates: 603 and 633 A.D. When the supposed altar was raised (no small job because it weighed 5-6 tons), it turned out to be the lid of a massive sepulcher. (R1)



Palenque's Temple of the Inscriptions. The left side of the schematic illustrates the many-tiered exterior. On the right is a cut-away view showing the internal stairway leading to the burial vault. Halfway down at a landing the stairs change direction. At this point, an underground passage admits air and light. (R2)

In reading the tale of Ruz's labored penetration into the very center of the Temple of the Inscriptions, one cannot escape the feeling that this structure resembles one of ancient Egypt's pyramids. There are the same huge stones, the blocked passages, the ornateness of

the vault. There is even a ventilation shaft analogous to those of the Great Pyramid. Stranger still was a long, sinuous clay tube that led out of the sarcophagus, up the stairway to a vertical stone slab that had blocked the passageway. (R2) Was this tube the escape pathway for the soul of the buried king? Who knows, but how like a concept out of ancient Egypt?!

These Egyptian innuendoes must be illusory because the pyramids on the Nile were raised about three millennia before the Maya constructed the Temple of the Inscriptions. Nevertheless, even Ruz, a professional archeologist, had to wonder a bit.

The sumptuous chamber brings us close to the Egyptian pyramids: evidently there was a similarity in the architectural function of the pyramid and in the spiritual attitude of the great leader-priest. Nevertheless, we believe that this discovery---the first in America to date---will not modify our concepts of the autonomous development of American culture. (R1)

X3. Transoceanic similarity of graphic artifacts. The case for cultural diffusion between the Old and New Worlds is better made by comparing some of Palenque's bas reliefs to those in Hindu and Buddhist temples. R.F. Dempewolf did this in a 1976 number of Science Digest.

In 1949, Dr. Gordon F. Ekholm, associate curator of anthropology at the American Museum of Natural History, exhibited cultural links between the Old and New Worlds. Among them was a Palenque bas-relief depicting a Maya priest holding a lotus blossom by the stem---a representation that Alma M. Reed, authority on Mexican art and Byzantine cultures, points out is startlingly similar to one in Khasaparna, India. A throne in the form of a lotus blossom appears in a Palenque sculpture. In the Temple of the Foliated Cross, a low relief lotus grows from a conch shell---a motif, Miss Reed observes, that appears on a Ninth-Century Javanese relief in Borobudur.

The dramatic similarity of Mayan

and Asiatic use of lotus designs, Dr. Ekholm indicated, is difficult to dismiss as "coincidence." (R3)

P. Tompkins made similar connections in his Mysteries of the Mexican Pyramids. (R4) Panels in both Old and New Worlds show fish eating lotus flowers. This motif is so specific that it must be taken more seriously than the similarities in pyramid architecture. Furthermore, the Mayan and Hindu cultural time frames are more compatible than those of the Maya and ancient Egyptians.

Although not mentioned in our primary references, but highly pertinent here, are some sculptured friezes near Mysore, India. These depict very precisely ears of maize, a New World plant. These friezes were wrought during the Twelfth and Thirteenth Centuries B.C., suggesting that an Asia-Mesoamerica contact may have preceeded the rise of the Maya! (R5)

X4. Egyptian units of measure? Pre-Columbian diffusion is also implied by measurements of the Temple of the Inscriptions. Instead of the Roman feet and inches said to have been employed by the Comalcalco brickmakers, H. Harleston, Jr., claims that Egyptian feet and cubits were used in laying out the Temple of the Inscriptions.

In 1974, Harleston reported that his measurements of the Temple of the Inscriptions were not integral multiples of the standard Mayan hunabs (1.059 meters). However, when Egyptian units were used, a remarkable progression of integral measurements resulted. (R4)

To add a caveat, one must always be suspicious of claims that require precision measurements of old structures that may have been eroded by the elements, jostled by earthquakes, and subject to settling foundations.

X5. Conclusions. Egyptian influences at Palenque, as suggested by architectural style (X2) and measurements (X4), are almost certainly illusory and coincidental, respectively. The temporal gap between the Mayan and Egyptian cultures is

simply too great to claim diffusion. On the other hand, the highly specific uses of the lotus motif, when bolstered by the apparent reverse diffusion of the maize motif, are very impressive.

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- R2. Ivanoff, Pierre; Maya, New York, 1973, p. 72. (X1, X2)
- R3. Dempewolf, Richard F.; "Palenque: A Mayan City Inspired by the Ancient East?" Science Digest, 79:36, August 1976. (X1, X3)
- R4. Tompkins, Peter; Mysteries of the Mexican Pyramids, New York, 1976, pp. 84, 254. (X3, X4)
- R5. Johannessen, Carl L.; "Indian Maize in the Twelfth Century B.C.," Nature, 332:587, 1988. (X4)

MSP4

Teotihuacan's Pyramid of the Sun

Description. Architectural and construction features at Teotihuacan, particularly at the Pyramid of the Sun, that suggest: (1) the strange ritual use of mica and water; (2) the precocious knowledge of pi and the structure of the solar system; and (3) the use of a pyramid structural feature to create an equinoctial clock.

Data Evaluation. Teotihuacan has been a favored research destination of many archeologists. Consequently, much has been written about the site in the journals. Much of this literature has been difficult to obtain, so we have relied mainly upon popular books. This use of secondary sources is reflected in the evaluations given below (the first figures in the ratings).

Anomaly Evaluations. The six potential anomalies we have identified at Teotihuacan are evaluated below (the second figures in the ratings).

- The significance of the apparent incorporation of pi into the dimensions of both the Pyramid of the Sun and some of the major ancient Egyptian pyramids (X2). Ratings: 2/1.
- The impressive equinoctial disappearance of a particular shadow cast by the Pyramid of the Sun and its possible connection with a similar phenomenon at Chichen Itza's Temple of Kukulcan (X3). Ratings: 2/2.
- The unknown significance of the massive sheets of mica found in the upper part of the Pyramid of the Sun and also beneath the stone floor of the Mica Temple (X4). Ratings: 1/2.
- The purpose of the long tunnel that snakes under the Pyramid of the Sun terminating in a cloverleaf of rooms (X5). Ratings: 1/2.

- The claim that the structure of the solar system is reflected in the plan of Teotihuacan (X6). Ratings: 3/1.
- The presence of canals, a river diversion, and water conduits at Teotihuacan and also within the long tunnel under the Pyramid of the Sun suggesting the ritual use of water similar to its supposed use at the Akapana at Tiahuanaco (X7). Ratings: 2/2.

Similar and Related Phenomena. The claimed incorporation of pi in the dimensions of some Egyptian pyramids (MSP1-X5, MSP8-X1); the equinoctial shadow seen at Chichen Itza (MSP1-X2); the equinoctial eclaire effect at the Great Pyramid (MSP6-X3); the claimed connection between the three major Giza pyramids and three belt stars in Orion (MSE8-X3); the possible ritual use of water at Tiahuanaco (MSM5-X3); the tunnel under the Pyramid of the Sun (MSE3-X2). The last three references are to be found in Ancient Infrastructure.

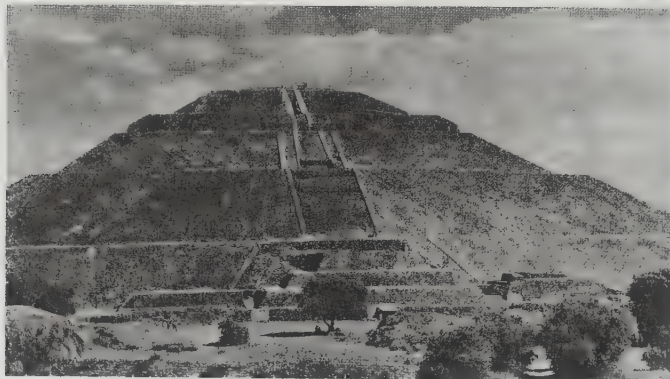
Entries

X1. Background and speculations. Teotihuacan is a great and ancient city in the Valley of Mexico located about 15 miles northeast of modern, burgeoning Mexico City. The Teotihuacanos were the predecessors of the Toltecs who, in turn, preceded the Aztecs. Just where the Teotihuacanos came from seems to be a minor anthropological mystery. They certainly interacted with the contemporary Maya to the south and on the Yucatan, and the pyramids at Teotihuacan do have a Mayan cast to them.

The construction of Teotihuacan probably began about 150 B.C., although the region was certainly peopled much earlier. During its glory days, 150-750 A.D., the area around Teotihuacan is thought to have supported about 200,000 people. It was then one of the

largest cities in the world. Suddenly, about 750 A.D., the Teotihuacan culture collapsed for reasons that are unclear. All of its temples and public buildings show signs of a conflagration. Perhaps it was a natural disaster, or maybe an invading army torched it. (R3)

During their ascendancy, the Teotihuacanos built two great stepped pyramids now called the Pyramid of the Sun and the Pyramid of the Moon. These two massive structures are connected by a broad avenue about 1½ miles long. The Aztecs named this the Avenue of the Dead, but no one knows what its builders called it. Although the Pyramid of the Moon is at one end of the Avenue of the Dead, the Pyramid of the Sun is offset from the other terminus, thereby destroying the city's symmetry in favor



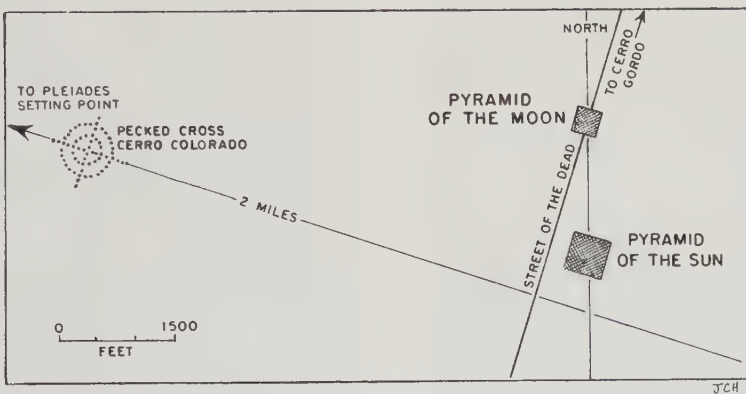
*The Pyramid of the Sun, Teotihuacan, Mexico.
(Mexican National Tourist Council)*

of some other geometrical imperative.

Actually, the entire city of Teotihuacan, including the two massive pyramids, are not oriented to the cardinal points like so many important ancient structures of both the New and Old Worlds. Rather, the Avenue of the Dead, the city's prime axis, lies $15\frac{1}{2}^\circ$ east of north. This unusual skewing is curious to say the least, but the archaeoastronomers believe they have found an astronomical reason for this. It seems that a

Originally, the Pyramid of the Sun was wider and taller but, during its reconstruction 1905-1910, as much as 20 feet of stones, mortar, plaster, and dirt were peeled off and its present brick surface revealed. Some have even speculated that its original base might have been made intentionally equal to that of the Great Pyramid (750 feet on a side)! (R3)

The original slope of the sides of the Pyramid of the Sun is difficult to deter-



Plan of central Teotihuacan. Although the Pyramids of the Sun and Moon are located on a meridian, the Street of the Dead is askew. See text for the archaeoastronomical significance. (R4)

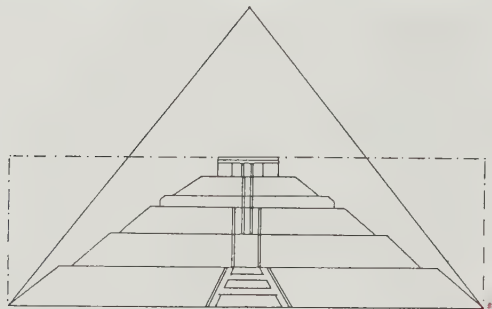
perpendicular to the Avenue of the Dead points to the setting of the Pleiades, that star grouping so significant to ancient cultures. Also satisfying to all those searching for astronomical conformations is the fact that the centers of the Pyramid of the Moon and the Pyramid of the Sun (which is offset from the Avenue of the Dead) nevertheless do lie on a north-south line. (R4)

The six puzzles of Teotihuacan that are listed above under Anomaly Evaluation are mostly associated with the Pyramid of the Sun. This immense pyramid, one of the largest man-made structures in the world, now measures 738 x 719 feet along its base. (R3) Its height is presently 203 feet. Its estimated volume is close to 30 million cubic feet, which easily surpasses the 22 million cubic feet of Monks Mound at Cahokia, Illinois.

mine precisely because of the removal of so much material during its extensive reconstruction. It is generally taken as 43.5° .

Far-fetched though it sounds, there is still another curious link to the Great Pyramid besides that of base dimensions. This connection is the first of the six Teotihuacan enigmas selected for this section of our catalog.

X2. Pi and pyramids. Although the bases of the Pyramid of the Sun at Teotihuacan and the Great Pyramid at Giza measure almost the same, the slopes of their sides are quite different: 43.5° for the Pyramid of the Sun and 52° for the Great Pyramid. As discussed in MSP1-X5,



The Pyramid of the Sun was constructed with sides sloping at 43.5° yielding a perimeter equal to 4π times the pyramid's height. A 52° angle (shown superimposed), which is seen in the Great Pyramid, yields perimeter-to-height ratio of 2π . (R5)

those Egyptian pyramids with a 52° slope necessarily possess perimeters that are equal to 2π times their heights. It would seem then that any speculations about Great Pyramid engineering practices and mystique somehow being transmitted over 8,000+ miles of distance and 2,000+ years of time to Teotihuacan must be baseless.

Not so! As a matter of fact, upon further consideration, the connection is actually strengthened. The Great Pyramid was constructed of solid stone blocks that could sustain 52° sides, but the Pyramid of the Sun is made of dirt, rubble, and stone facing. It would not support a 52° angle. Its builders had to be happy with 43.5° for reasons of stability. This angle, it turns out, yields a pyramid with a perimeter equal to 4π times its height. So, that mystical link to π , that transcendental number, also appears in the New World. But could the π -idea have come from the ancient Nile?

That the ancient Egyptians knew of π , even only approximately, is not particularly surprising for they were rather sophisticated mathematically. But it seems very unlikely that the Teotihuacanos, who did not even use the wheel for transportation, knew about π . Looking at it this way, one would conclude that it was only accidental that the builders of the Pyramid of the Sun made its base about the same size as that of

the Great Pyramid and also incorporated π in their pyramid's dimensions. Supporting this conclusion is the fact that the Pyramid of the Sun is the only New World pyramid with π in its geometry. (R5) Apparently, no other New World cultures received any mathematical insights from ancient Egypt! (See also MSP8-X1)

Reason, distance, and time-gap seem to emphatically preclude any cultural connection between the designers of the Pyramid of the Sun and the pyramids of ancient Egypt. But there is still more to the speculative connection. In MSP1-X5, we see that the base of the Bent Pyramid at Dahshur, Egypt, begins with the 52° angle but switches part way up to 43.5° ---the same angle used in the Pyramid of the Sun at Teotihuacan. Furthermore, the squat Red Pyramid, also at Dahshur, uses the 43.5° angle throughout. It almost seems that we have too many transoceanic coincidences to slough off easily.

Lastly, it is an additional puzzle why π should be involved at all in practical pyramid design in either the New or Old Worlds. If π was used for a reason, it must have been a mystical reason---the same sort of thinking that puts steeples on churches so as to be closer to heaven.

X3. The shadow connection. Sun and shadow can play strange optical tricks with geometrically regular structures, such as the tiered pyramids and block-like buildings at Teotihuacan. A good example of these tricks of lighting can also be seen at the Temple of Kukulcan at Chichen Itza at the equinoxes, when a serpentine shadow is cast by the setting sun. (MSP1-X2)

A mobile shadow phenomenon is also seen, again at the equinoxes, on the western face of the Pyramid of the Sun. The phenomenon occurs on the lower part of the fourth tier. This section is in shadow until the sun passes through zenith on equinox days. As the sun passes through zenith, it illuminates this section of the tier from south to north in a 66-second display. This phenomenon occurs only on the equinoxes because this lower section of the fourth tier makes an angle of 19.7° with the vertical. It is the only part of the Pyramid of the Sun constructed at this angle.

It is an angle with special significance, for 19.7° is also the latitude of Teotihuacan. (R2)

This optical display in effect makes the Pyramid of the Sun a clock that signals the equinoxes to anyone aware of this post-zenith progressing strip of sunlight. A similar shadow effect occurs at the Great Pyramid at the equinoxes. (MSP6-X3)

A first question is: Did the builders of the Pyramid of the Sun deliberately design this part of the pyramid to produce this effect or is it all just a lucky coincidence? Secondly, if the effect is intentional, did the Teotihuacanos copy it from the Maya at Chichen Itza, or was it vice versa? Of course, both the Chichen Itza and Teotihuacan phenomena could have been conceived independently.

The skeptic is justified in saying that interesting shadow effects can be seen in many geometrically configured structures. It just so happens that very similar effects transpire on the equinoxes at Teotihuacan, Chichen Itza, and the Great Pyramid. Coincidence again?

X4. The mysterious sheet of mica. Little is known about this strange artifact. It was discovered in 1906 during the excavations of the Pyramid of the Sun conducted by L. Batres. The mica was evidently laid down in the form of a thick layer covering the top of the fifth tier of the pyramid. Since large slabs of mica have considerable commercial value for their electrical properties, it is hardly surprising that this artifact quickly disappeared. (R3) Unfortunately, we have no data on hand as to the area and thickness of the mica layer. We do not even know if there was a single massive sheet or a layer of smaller sheets fitted together.

The pyramid's mica was not the only occurrence of this peculiar material at Teotihuacan. G. Hancock has related the discovery of still other large sheets of mica that were hidden under the stone floor of the aptly named Mica Temple. This temple is located about 1,000 feet south of the western face of the Pyramid of the Sun. More is known about this find. There were two sheets of mica neatly cut and forming a two-layer sandwich. Hancock does not give the thicknesses of the sheets but states that they

were 90 feet square! (R5) If the floor area is truly 90 feet square (8,100 square feet), we must assume that many small slabs of mica were fit together. Hancock added that the impurities in the mica indicated that it probably came from Brazil rather than local sources. The implication is that the Teotihuacanos had a trading network that reached into South America. (R5)

Mica has little practical value as a structural material, so we have to be puzzled by its use in at least two buildings at Teotihuacan---hidden from view in both cases! Of course, mica is a strange material, being easy to pull apart in thin translucent sheets. The North American Indians used to cut mica sheets into various shapes for ornaments. Mica is also found in many burial mounds north of Mexico. It is possible that the Teotihuacanos thought that mica had some mystical property that focussed some cosmic principle wherever it was used. In any case, the mica sheets at Teotihuacan remain mysterious.

A tenuous and subtle connection can be made between the Teotihuacan mica sheets and the strange cavities filled with sifted, mineral-enriched sand in the Great Pyramid. (MSP7)

X5. The long tunnel under the Pyramid of the Sun. One of the strangest subterranean structures in Mesoamerica is a tunnel---half-natural and half-manmade---that snakes under the Pyramid of the Sun. The tunnel is 103 meters long and ends in a cloverleaf pattern of four chambers located almost under the center of the pyramid above. These chambers contained basalt discs and clay vessels which had been broken intentionally. Obviously, the tunnel and chambers saw the enactment of many prehistoric subterranean rituals; but what these were like we do not know. The Teotihuacanos left no written record. (R2, R3)

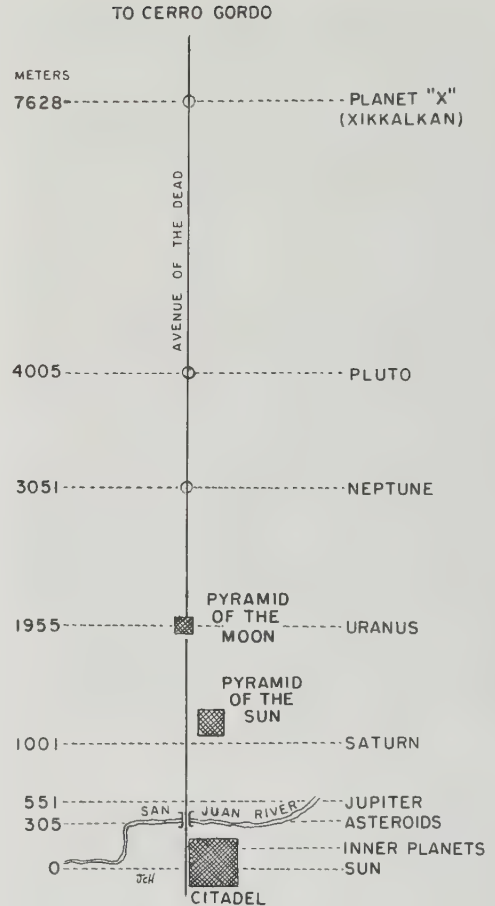
Additional information on the tunnel is cataloged at MSE3-X2 in Ancient Infrastructure. This volume also describes the cloverleaf chambers at the bottoms of some of the British dene holes. (MSE3-X4)

X6. Teotihuacan as a model of the solar system. The three major pyramids at Giza, Egypt, are said by some to model in size and position the brightnesses and location of the three bright belt stars in the Orion constellation. (MSE8-X3 in Ancient Infrastructure) It has been further speculated that the dimensions of the Great Pyramid at Giza reflect the past and future history of the earth. Other great structures raised by ancient cultures have been interpreted in similar ways; that is, they embody astronomical and/or historical data. It appears that the city of Teotihuacan must be included in this group of structures incorporating special knowledge of some sort. Perhaps the builders of these edifices, the thinking goes, possessed precocious knowledge or received information via divine revelations or even from extraterrestrial visitors!

In the case of Teotihuacan, H. Harleston, Jr., an American engineer, claimed that the city was laid out to model the solar system. G. Hancock summarized Harleston's claims in the following paragraph.

What Harleston's investigations had shown was that a complex mathematical relationship appeared to exist among the principal structures lined up along the Street of the Dead (and indeed beyond it). This relationship suggested something extraordinary, namely that Teotihuacan might originally been designed as a precise scale-model of the solar system. At any rate, if the centre line of the Temple of Quetzalcoatl were taken as denoting the position of the sun, markers laid out northwards from it along the axis of the Street of the Dead seemed to indicate the correct orbital distances of the inner planets, the asteroid belt, Jupiter, Saturn (represented by the so-called 'Sun' Pyramid), Uranus (by the 'Moon' Pyramid), and Neptune and Pluto by as yet unexcavated mounds some kilometres farther north. (R5, citing R2)

We suppose that the natives of Teotihuacan could never themselves have learned of the asteroid belt or the farthest planets. "Obviously" say the speculators, this information was imparted to them by aliens or, possibly, prescient Teotihuacanos. Waxing skeptical, one can maintain that there are many structures



H. Harleston, Jr., hypothesized that the markers found along the Street of the Dead were spaced so as to model the solar system. (R2)

along the Avenue of the Dead that might mark planetary positions. Indeed, there are so many possibilities that one can model many things, just as has been done so often with the dimensions of the Great Pyramid. (MSP8)

X7. Teotihuacan's water-control structures. As pointed out in X1, the city of Teotihuacan is not aligned with the cardinal points but is skewed $15\frac{1}{2}^\circ$. This alignment, which seems to be associated

with the setting of the Pleiades, was so important to the Teotihuacanos that they altered the course of the nearby San Juan River to conform to it. (R4) There is also evidence that water once flowed along the Avenue of the Dead. Clues to the purpose of these seemingly impractical labors of Teotihuacan's inhabitants may lie in that strange tunnel that runs beneath the Pyramid of the Sun. (X5) Within this tunnel exists a complex drainage system involving interlocking sluices carved in the rock. All this in a place where no natural water source is now available! Evidently, flowing water had some mystical significance to the Teotihuacanos, and they took special pains to make it flow in certain ways.

To us today, the ritual control of water has little mystical value except at baptism fonts. In this connection, it should be noted that water also seem to have been ritually used at Tiahuanaco, in Bolivia in roughly the same time period. The huge mound or pyramid called the Akapana was crowned by a large water

basin. Carved stone troughs channeled the flow of water down the side of the structure for purposes we can only guess at. (MSM5-X3 in Ancient Infrastructure)

References

- R1. Millon, Rene; "The Beginnings of Teotihuacan," American Antiquity, 26:1, 1960. (X1)
- R2. Tompkins, Peter; Mysteries of the Mexican Pyramids, New York, 1976, pp. 244. 264. 332. (X3, X5, X6)
- R3. Zink, David D.; The Ancient Stones Speak, New York, 1979, p. 89. (X1, X4, X5)
- R4. Devreux, Paul; Secrets of Ancient and Sacred Places, London, 1992, p. 66. (X1, X7)
- R5. Hancock, Graham; Fingerprints of the Gods, New York, 1995, p. 177. (X2, X4, X6, X7)

MSP5

The Great Pyramid: Statistics and General Anomalistics

Description. A short description of the Great Pyramid and the two general classes of anomalies to be considered in more detail in MSP6-MSP8.

Data Evaluation. The Great Pyramid is probably the most thoroughly measured and studied building of antiquity. The pertinent literature is immense, as can be seen in the references for this section and, in greater depth, in MSP6-MSP8.
Rating: 1.

Anomaly Evaluation. No anomalies are presented in the section.

Entries

X0. Introduction. Of all the enigmatic ancient structures examined in this volume and its predecessor, Ancient Infrastructure, the Great Pyramid unquestionably possesses the largest inventory of intriguing and puzzling features. It is immensely old and, for its size alone, it well deserves the adjective "Great." Further, the Great Pyramid displays superb craftsmanship and engineering know-how. Its completion some 4,600 years ago marked a zenith in human architectural feats that was not equalled for several millennia.

Rising some 481 feet above the Giza Plateau near Cairo, its sheer size grips the modern visitor. The Great Pyramid must have been even more impressive 4,600 years ago when it was (supposedly) encased in gleaming, white limestone and was, perhaps, also painted and capped with an ornate pyramidion or capstone.

Words such as those above are standard fare in the history and archeology books. They are certainly accurate, but here we are concerned with anomalies rather than general impressions; that is, those features of the Great Pyramid that challenge our accepted model of the ancient Egyptian culture, especially its engineering capabilities. Sheer size and architectural beauty are not necessarily anomalous. We look mainly for features that seem to be beyond the known technical capabilities of Egypt's Fourth Dynasty, that fertile period during which the Great Pyramid rose course-by-course from the bleak Giza Plateau. In addition we look for technical innovation and precocious knowledge of science and mathematics.

Of course, there are always questions about the purpose of the Great Pyramid: first as a unified structure and, second, in the significance of its several chambers, passageways, and galleries---all of which display puzzling features. However, we can only speculate about the transcendental and mystical objectives of the pyramid builders. It is difficult for us to say whether they were simply burying a Pharaoh in grandiose style or, perhaps, going beyond this in attempting to convey some message to their perceived gods or even to posterity, as encoded in the Great Pyramid's dimensions and orientations.

Thus, as in so many ancient structures, the enigmas split neatly into two

groups: (1) those concerned with mundane engineering (MSP6); and (2) those associated with purpose (MSP7-MSP8); the latter being much more elusive than the former.

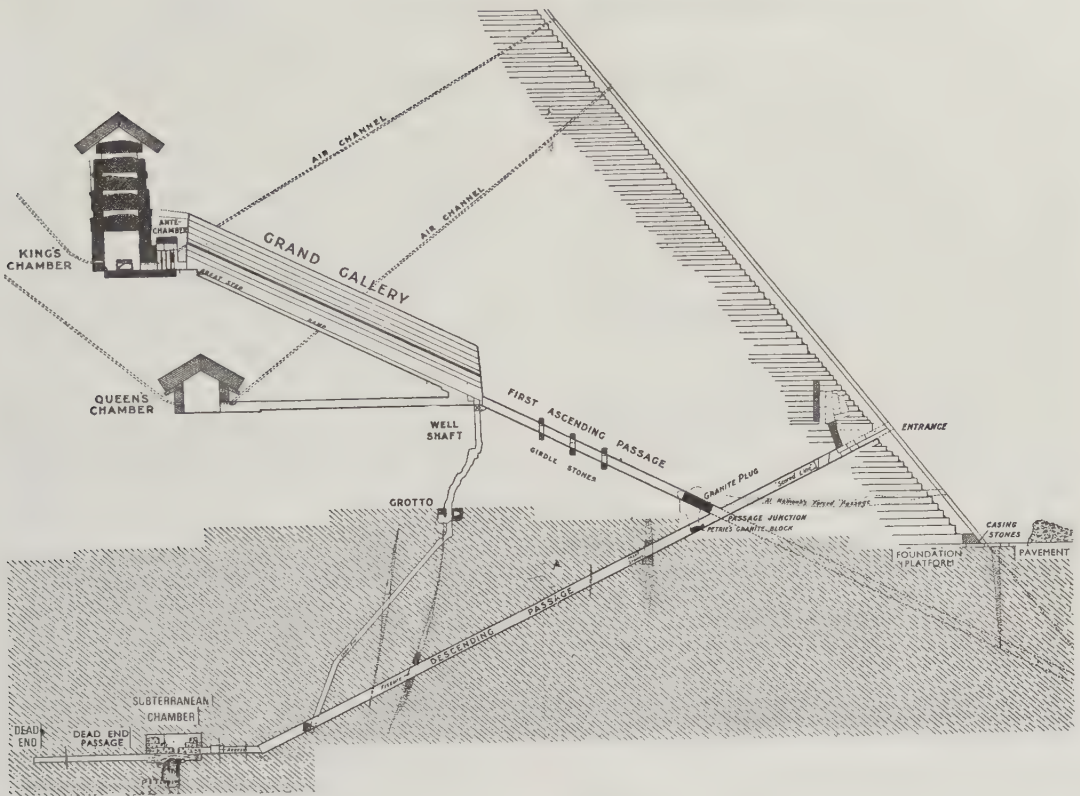
Before launching into details, we provide some basic statistics about this immense mountain of limestone blocks.

X1. Great Pyramid statistics. The construction of the Great Pyramid commenced about 2,600 B.C., during the amazingly fruitful Fourth Dynasty. This structure was, therefore, contemporaneous with the erection of Stonehenge thousands of miles away. The technical sophistication of these two structures is obviously quite different, but we may speculate that the two diverse cultures may have had similar mystical and astronomical objectives.

The Great Pyramid possesses a square base, each side being almost exactly 756 feet (230 meters) long; the longest side being only about 8 inches (19 centimeters) longer than the shortest. This is remarkable precision over such a distance for engineers 4,600 years ago.

The pyramid covers an area of 13.1 acres (53,000 square meters) of the Giza Plateau. As the illustration shows, some of the Plateau's limestone projects upward into the pyramid proper; that is, the pyramid was not built upon a flat surface.

About 2,300,000 blocks of Tura limestone were quarried just up river, ferried downstream, and then somehow hauled to the Plateau. Some granite in the Great Pyramid (the King's Chamber, for example) came from Aswan about 500 miles upstream. The present ragged appearance of the pyramid is probably due to the removal of about 100,000 limestone casing stones during and after the Ninth Century A.D. for construction in Cairo and elsewhere in Egypt. (We do not really know how much of the pyramid was covered with casing stones.) These casing stones were among the largest used in the pyramid, weighing 16-20 tons each. In contrast, the average internal blocks weigh only about 2.5 tons each. Altogether, the pyramid builders hauled and raised about 6.3 million tons of limestone and granite



Section through the Great Pyramid, the most complex and (to the compiler) the most anomalous of all ancient structures. Virtually all of the features labeled on this drawing are anomalous or, at the very least, curious enough to expound upon in some detail in MSP6-MSP8. Note the following points about this drawing:

- (1) We do not know that the air channels are really straight as shown or even if they are really air channels;
- (2) The air channels ending in the Queen's Chamber apparently do not reach to the pyramid's outer face;
- (3) The bedrock of the Giza Plateau actually projects up into the body of the pyramid;
- (4) The King's Chamber's relieving compartments may not have been emplaced for "structural relief," as implied;
- (5) There is no extension of the Ascending Passage to the right past its juncture with the Descending Passage;
- (6) It is only assumed that casing stones covered the entire outside of the pyramid;
- (7) There still may be undiscovered chambers and passages inside and/or beneath the pyramid.

blocks---enough to build about 30 Empire State Buildings.

Originally, the Great Pyramid was about 481 feet high, but the top twelve courses are now missing, as is the possible pyramidion or capstone. The courses of limestone blocks are not uniform. For example, the blocks in the 35th. course, 100 feet above the base, weigh 10-15 tons compared to the average 2.5 tons. This is just one of the many "engineering" enigmas presented by this amazing structure. (MSP6) The inclination of the pyramid's triangular faces is 51°52', a figure which has interesting numerical implications. (MSP8)

Internally, the Great Pyramid is complex, as diagrammed. There may actually be additional chambers and passageways, and many have searched for them over the years. Each of the known internal features poses its own list of engineering conundrums and, of course, those nagging, ever-present questions of purpose. Why so many chambers? Was anyone ever interred in any of them? What was the purpose of the well and that curious grotto deep in the natural limestone of the Giza Plateau? Etc. and etc.

X2. Subjects not addressed here. There are several questions that we do not attempt to discuss in this volume. The answers are probably most interesting, but the anomaly levels seem low and the topics are tangential to our inquiry. Some of these questions are:

- Was the Great Pyramid ever painted?
- Did it ever have as pyramidion and, if so, what happened to it?
- Were the nearby "Trial Passages" really "dry runs" to train workers and test engineering concepts?
- Why are there no inscriptions inside the Great Pyramid when so many other structures of its time are covered with them?
- Does the pyramid geometry focus unrecognized influences that prevent the decay of organic substances? This "pyramid-power" claim has been thoroughly refuted in modern tests. (R2)

References

- R1. Edwards, I.E.S.; The Pyramids of Egypt, New York, 1972, p. 82.
- R2. Krupp, E.C.; "Recasting the Past: Powerful Pyramids, Lost Continents, and Ancient Astronauts," in: G.O. Abell, ed.; Science and the Paranormal, New York, 1981, p. 257.
- R3. Krupp, E.C.; Echoes of the Ancient Skies, New York, 1983, p. 100.
- R4. Hawkins, Gerald S.; Mindsteps to the Cosmos, New York, 1983, p. 112.
- R5. Bauval, Robert, and Gilbert, Adrian; The Orion Mystery, New York, 1994.
- R6. Dunn, Christopher; The Giza Powerplant, Santa Fe, 1998, p. 58.

MSP6

Great Pyramid: Material Processing

and Whole-Structure Enigmas

Description. The oft-debated problems concerning the quarrying, transportation, lifting, and precision-fitting of the stone blocks comprising the Great Pyramid. The salient question has always asked how the Fourth-Dynasty Egyptian engineers managed to accomplish these tasks with their simple tools. Also included here are enigmas relating to the pyramid-as-a-whole: its precision-orientation, the creases in the pyramid's sides, the curious stone-block distribution in the tiers, and the apparent high moisture content of the limestone core blocks.

Data Acquisition. Travellers, scientists, and engineers have long speculated about how the ancient Egyptians solved the formidable engineering problems they encountered in the construction of the Great Pyramid. The popular and professional literatures are broad and deep. Unfortunately, virtually none of these many sources delve into what we believe were really the most challenging tasks, such as the precision manufacture of thousands of odd-shaped casing stones, the sawing of hard granite with soft copper tools, the types of scaffolding used at the higher tiers, and, far from least, the logistical problems involved in the manufacture and installation of 2,300,000 stone blocks in a period of 20 years.

Below we select nine potential anomalies that we consider to be the most important. The data ratings for each are the first figures in the evaluations.

Anomaly Evaluation. We recognize the following nine major anomalies and curiosities associated with the procurement and construction of the Great Pyramid. The anomaly ratings are the second figures in the evaluations.

- The loading of 70-ton granite blocks onto barges at Aswan and their transportation 500 miles downstream to Giza for unloading (X1). Evaluations: 3/2.
- The absence of a scientific consensus as to how the Great Pyramid's 2,300,000 multiton stone blocks were raised and maneuvered into place in pyramid courses hundreds of feet above the pyramid base (X1). Evaluations: 3/2.
- The logistics and social organization required to procure, process, and emplace one multiton stone block approximately every 2-3 minutes, 12 hours a day, over a period of about 20 years (X1). Evaluations: 3/1.
- The precision-shaping and -finishing of the Great Pyramid's limestone core blocks and irregular casing stones, and, especially, the hard granite blocks of the King's Chamber and elsewhere (X2). Evaluations: 3/1.
- The apparent ability of Egyptian workmen to drill very rapidly into the the obdurate granite of the sarcophagus in the King's Chamber (X2). Evaluations: 3/1.
- The claimed air bubbles, excess moisture, unusual debris, and lack of stratification in the limestone core blocks (X2). Evaluations: 2/2.
- Our ignorance as to exactly how the Egyptians were able to saw, drill, and polish granite with soft copper tools. Tooling is considered to be different from the achievement of high precision (X2). Evaluations: 3/1.
- The significance of the slight creases in the faces of the pyramid (X3). Evaluations: 3/2.

- The obscure reasoning behind the use of the largest core blocks near the 35th. tier rather than at the structure's base (X3). Evaluations: 1/2)

Similar and Related Phenomena. Precision Inca stonework (MSB4); light-and-shadow phenomena at Chichen Itza (MSP1-X2) and Teotihuacan (MSP4-X3); the quarrying and transportation of giant stone blocks at Baalbek (MSB8); other Great-Pyramid enigmas (MSP7, MSP8).

Entries

X0. Introduction. Certainly a monstrous pyramid consisting of 2,300,000 multiton stone blocks demands an answer to the question: How could such a massive structure have been raised 4,500 years ago? Stones weighing up to 70 tons had to be carved out of quarries, transported by water and land to the Giza Plateau, and then raised hundreds of vertical feet. Many popular writers have doubted the engineering capabilities of the ancient Egyptians and have therefore invoked the presence of aliens equipped with stone-cutting lasers and fantastic levitating devices. In truth, the ancient Egyptians managed to build large, often very beautiful, stone structures with the simplest of tools, lots of manpower, great ingenuity, and a well-organized society.

This is not to say that the Great Pyramid offers no engineering enigmas. We still do not know exactly how they "machined" limestone and, especially, granite, with such incredible precision. And why did they use much bigger limestone blocks in some of the upper courses of the Great Pyramid? What was the real purpose of that strange "creases" in the pyramid's sides? We will focus on such "engineering" mysteries in this section. Although we will not invoke an alien presence, we will have to admit that we still do not understand how and why some things were done as they were on the Giza Plateau about 4,500 years ago.

wards of 400 feet high, so even today this would not be a trivial problem with blocks weighing several tons.

Quarrying. The Great Pyramid was built mainly with limestone quarried on the Giza Plateau itself and at Tura in the nearby Mukattam Hills just across the Nile from Giza. Most limestone is rather soft, easily quarried, and rough-dressed. But the historians assert that the engineers of the Fourth Dynasty had only soft copper tools to work with. It is thought that bronze, which is much harder, had not yet been introduced along the Nile. The copper saws, wedges, and chisels available to the builders of the Great Pyramid would have been rather ineffective in cutting even the Tura limestone if not augmented in some way.

Some scientists do suggest that the ancient Egyptians had invented a method of tempering their copper tools to a hardness that allowed them to readily carve limestone blocks from their quarries. Unfortunately, this secret has been lost ---assuming it ever existed.

A second way of increasing the stone-cutting power of the soft Egyptian copper tools would have been the use of slurries of quartz sand or perhaps even harder minerals. Quartz is much harder than limestone and would have greatly increased the cutting power of copper saws when working with this type of stone. (R2)

Through the use of abrasive slurries, copper wedges, levers, and hammers of hard stone, the quarrying and rough dressing of soft limestone blocks probably presented no serious problems to the Egyptian engineers 4,500 years ago.

But quarrying and shaping the granite blocks used in the King's Chamber and sparingly elsewhere in the Great Pyramid must have been a different story. Granite is a much harder rock than limestone; it even includes quartz in its matrix. Nevertheless, the Fourth

X1. Material acquisition and handling. First, we examine the problems the ancient Egyptians faced in quarrying the stone blocks destined for the Great Pyramid, transporting them to the Giza Plateau, and then physically raising them to the pyramid's stepped tiers for installation. The uppermost tiers were up-

Dynasty's granite quarries at Aswan, 500 miles up the Nile, still show the slots that the Egyptians had somehow cut in the obdurate granite for the introduction of their wedges and the subsequent splitting off of large chunks of this very hard rock. Some of these "chunks" were large indeed---some 70 tons when dressed and finally installed in the King's Chamber of the Great Pyramid.

It is surmised that at Aswan, when the Egyptian workers cut the wedge slots, they simply pounded the granite to a powder with harder rocks, such as dolerite, which was readily available nearby. The wedge slots at Aswan---which are wide enough for human entrance---could, in principle, have been pounded out in this manner, given enough time. In fact, dolerite hammerstones are present at the Aswan quarry in large numbers, making this method the most probable one. However, saw marks are very obvious on the granite sarcophagus in the King's Chamber, so we can suppose that copper saws, assisted by abrasive slurries, might also have had a minor role at Aswan. Indeed, there are no better suggestions on the table, unless one posits radical theories involving high technology imported from Atlantis or extraterrestrial intervention! We will not embark on such routes.

There is much supposition in the foregoing paragraphs. We have only potential answers---no certainties.

In MSB4, we see that the Incas were also, some 4,000 years later, faced with similar stone-working problems. And we are not sure how they cut and dressed the hard stones seen in their massive and magnificent walls either.

M. Payne has pointed out a minor mystery at the Egyptian limestone quarries that is worth mentioning. The limestone that was used in the Great Pyramid often contained fossils and cracks. It splits easily when quarried and handled. Yet, there are few spoiled blocks or rejects littering the quarries. Surely, considering that there are 2,300,000 limestone blocks in the pyramid, there must have been hundreds, perhaps thousands of rejects; but they are virtually nonexistent. (R10)

Transportation of the blocks. Doubts have long been raised about the ability of ancient peoples to haul heavy objects over long distances. This same problem

arises in our companion volume Ancient Infrastructure (MSD1) in connection with Stonehenge and other megalithic sites. The Incas, too, faced and conquered similar problems at Ollantaytambo and Sacsahuaman (MSF2)---without requiring the services of aliens equipped with antigravity machinery. The most reasonable answer to ancient transportation problems is, of course, a large supply of manpower. That this is how the Egyptians probably transported their heavy stone blocks to the site of the Great Pyramid is suggested in their depiction of a huge stone monolith being dragged along on a sledge pulled by humans. (See figure.) Surrounded as we are today by all manner of machinery, it is easy to forget the efficacy of coordinated muscle power.

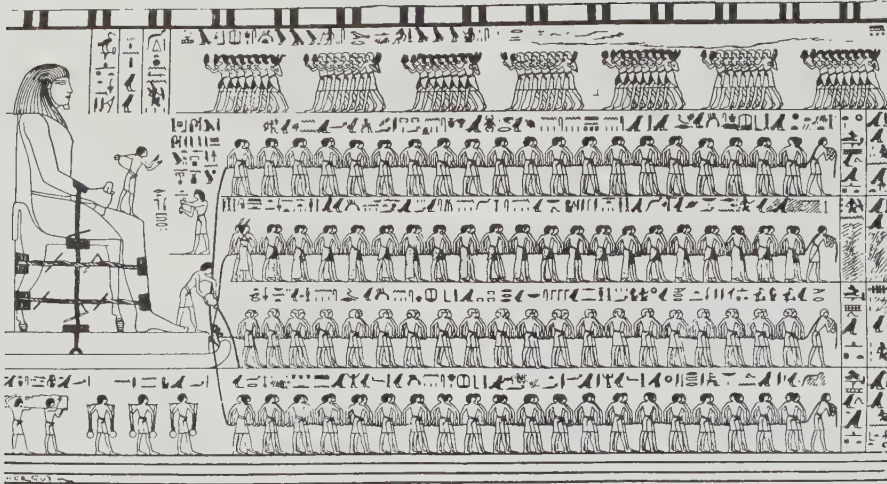
Actually, the builders of the Great Pyramid faced three major transportation tasks:

(1) Moving the great bulk of the 2,300,000 limestone blocks destined for the pyramid core a few hundred yards from quarries on the Giza Plateau to the pyramid site. These blocks averaged 2.5 tons, but some weighed as much as 30 tons. For some unknown reason, these larger blocks were destined for some of the higher tiers in the pyramid. (X3)

(2) Moving over 100,000 blocks of harder Tura limestone onto to barges and thence several miles down the Nile to Giza. Many of these were fashioned into the pyramid's casing stones.

(3) Moving granite blocks from the Aswan quarry, about 500 miles upstream, to the pyramid site. Some of these blocks weighed about 70 tons and presented the most formidable transportation challenge of all.

As intimated earlier, the hauling of multiton stone blocks overland apparently presented no difficulties when an adequate labor force was available. Roads or causeways of stone or wood, lubricated with water or oil, formed a solid, slippery base for sledges. Land distances were short: quarry to barge, barge to pyramid site. In fact, the historian Herodotus recorded that a causeway of polished stone, 3,000 feet long and 60 feet wide, eased the transportation of blocks from the barge



This ancient Egyptian painting is routinely produced to demonstrate how very large objects---a massive statue in this case---were placed upon sledges and dragged to their destinations by brute force. (R1)

terminal on the Nile to Giza. (R1) The blocks quarried on the Giza Plateau itself had to be moved only a few hundred yards. No hauling problem there.

Some may complain that we are making light of the transportation problem. If doubts remain concerning the efficacy of these crude methods, field tests made for a TV documentary in 1998 should dispel them.

E. Hadingham has described how three different techniques were made to move 3-4 ton stone blocks in these tests. First, the blocks were placed on sleds that were pulled along over log rollers. The sleds, however, proved very difficult to control and kept veering off course. A second approach required that the blocks be tumbled end-over-end. This was clumsy and laborious. In the end, it was discovered that the sled and its weighty cargo could be pulled quite easily---only 20 men were needed---over a water-lubricated trackway made of planks set like railroad ties. (R18)

The most difficult transportation task was probably not on land at all, but on that 500-mile journey down the Nile from Aswan. Loading 70-ton monoliths onto barges and then unloading them at Giza---without block-and-tackle---must have been a tricky business. We have never

seen depictions of the massive barges employed to ferry the granite blocks from Aswan. It has been suggested that they were made of reeds! Somehow this seems unlikely given the 70-ton cargoes and the large crews necessary for handling and propelling these big barges. And, as I.E.S. Edwards has pointed out, the long trip down the Nile, although aided by the current, was not totally hazard-free.

The navigation of these megaliths, probably undertaken in the main during the inundation season, may well have been the least formidable part of the whole task, though control of heavily laden barges on a fast-flowing river must always have been a hazardous operation requiring great skill. Moreover, the journey from Aswan, although free from cataracts, involved negotiating the difficult waters and shifting sandbanks near Gebel Abu Foda, about ninety miles south of Saqqara. (R2)

All in all, the horizontal-transportation challenges encountered during the construction of the Great Pyramid seem to have been minor compared to the those faced in lifting the blocks vertically to the pyramid's upper tiers once

they arrived at the staging area on the Giza Plateau.

Raising and maneuvering the Great Pyramid's stone blocks. G. Hancock has counted more than thirty proposals submitted over the years for lifting ton-sized blocks hundreds of feet during pyramid construction. (R15) No consensus exists as to which lifting techniques were actually adopted at Giza. Here, we have a major enigma that has dogged archeologists for centuries and filled all the Great-Pyramid books. But at least there are many potential solutions---a situation absent in some of the mysteries encountered later in this chapter.

The Great Pyramid engineers were without doubt familiar with the mechanical advantage offered by levers, but they do not seem to have invented block-and-tackle. But they probably did grasp the lifting potential of hydraulic devices. Indeed, several of the proposed lifting schemes have utilized water-filled locks and channels to raise stone blocks to the pyramid's upper tiers. (R6, R9)

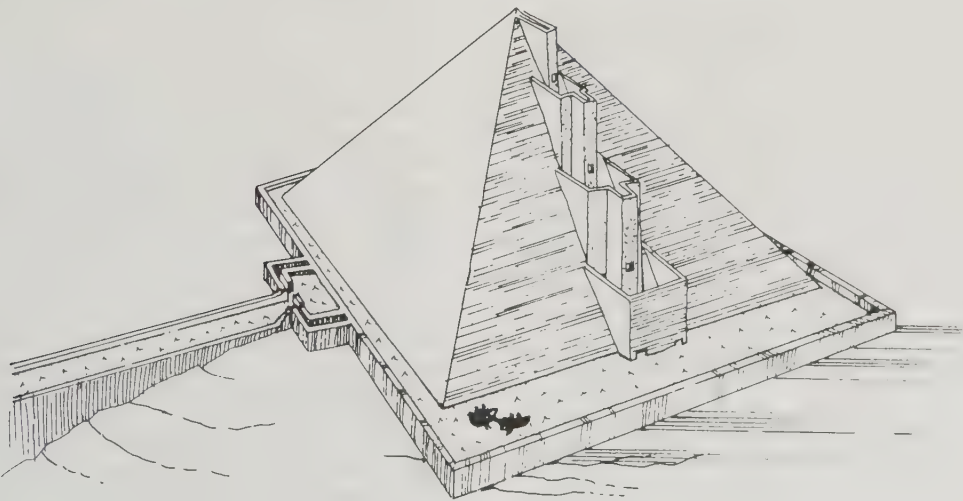
Certainly, the most common proposal for block-lifting has been the construction of earthen ramps leading up to the working level of the structure. (R19) One scheme has the ramp wrapped round and round the growing pyramid. Other

ramps are straight and stretch for hundreds of feet. It is true that the remains of some ramps exist at Giza, but it is arguable that ramps were employed to drag blocks all the way to the top of the Great Pyramid. The major objection to ramps is the fact that a ramp with a practical slope for dragging blocks would be so long that it would require a volume of stones and sand larger than that of the pyramid itself. (R15) Furthermore, there is no convincing evidence that such a giant ramp was ever built.

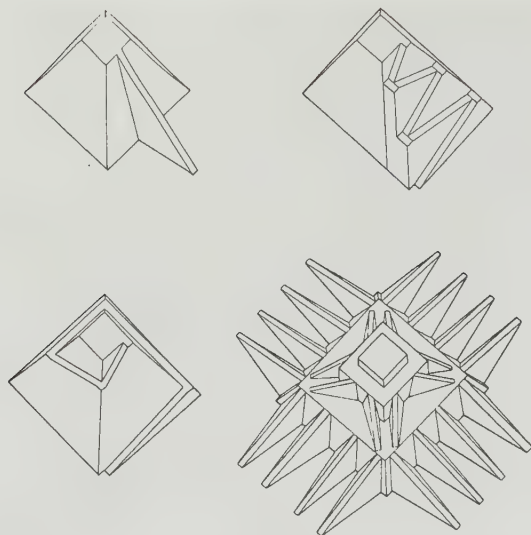
We have no intention of reviewing and evaluating the thirty-plus proposed lifting schemes. For the anomalist, it is sufficient to identify, not solve, the engineering problems. The anomaly here is the existence of a bevy of possible solutions but no general consensus as to which one was actually employed at the Great Pyramid. We rate such situations as merely modestly anomalous because solutions are at hand but we cannot decide which was actually used!

In the end, it may be that Herodotus was right when he speculated---2,500 years ago---that the Great Pyramid's stones were raised inch-by-inch using only "short pieces of wood," meaning, we suppose "levers and shims." Even today, these elementary lifting machines are invaluable in heavy construction work.

There is, however, an engineering



One of the hydraulic schemes conceived for raising large stone blocks during pyramid construction (R6)



Four of the many types of earthen ramps that have been proposed to explain how the Egyptians raised large stone blocks into position during the construction of their pyramids. (R19)

problem that has received little attention in the literature: scaffolding. In these latter days, although the sides of the Great Pyramid are severely stepped rather than smooth, due to the (hypothesized) removal of a many acres of casing stones, pyramid climbers still slip and fall to their deaths. The ancient masons and laborers had to stand somewhere as they eased stone blocks into place. This must have been especially hazardous when the casing stones were installed near the top. Some of these stone blocks weighed as much as 16-20 tons and, further, they were irregular in shape. (X2) How did workers cling to the flat finished surfaces of the pyramid and maintain their footing in the presence of the lubricants that must have been used to ease the motion of rock against rock? In addition, there was a slippery slathering of cement laid down to hold the stones in place? Remember that the slope of the pyramid's sides is 54° ---much steeper than house roofs! If scaffolding was constructed around those ancient work sites perched precariously hundreds of feet above the

ground, no evidence of it survives today. Such "practical" problems seem to be ignored by most Great-Pyramid speculators.

Time-and-motion studies of the Giza operation. Great-Pyramid analysts have long amused themselves by estimating the number of laborers it would take to construct the pyramid in the 20-or-so years that its builder, supposedly Khufu, ruled the land. The disparity in the estimates are rather amusing because they demonstrate the great influence of initial assumptions. Even so, these time-and-motion studies can be instructive and, in addition, lead to the recognition of logistical anomalies. For example, we might ask if ancient Egypt really had enough surplus manpower to raise the pyramid in 20 years, or whether there was really enough room for the workers to stand as they dragged the big limestone blocks up ramps---assuming that is what they did in fact.

One dimension of Giza logistics can be seen in a calculation offered by M. Payne.

2,300,000 stones divided by 20 years equals 115,000 stones per year.
115,000 stones divided by 365 days equals 315 stones per day, at 12 daylight hours per day equals 26.25 stones per hour, or one stone put in place each 2 minutes 17 seconds for 20 years, working every day during all of daylight. (R10)

This is an eye-opening result to be sure. Even if 100 years were assumed, that would still mean one block every 11 minutes! A present-day bricklayer would be pushed to cement into place with high precision one 5-pound brick every 2 minutes, 17 seconds; 2.5-ton limestone blocks would seem to be out-of-the-question.

Payne next used "reasonable" estimates for the pulling and lifting power of human beings and calculated how many workers would be needed to install the pyramid's stones at the 2-minute, 17-second rate. He found that some 50,000 human beings would have had to be crowded into the area of a football field. (R10) This would be physically possible but fraught with traffic nightmares with the veritable flood of blocks arriving at the Nile barge terminal and the nearby Giza quarries.

One can also visualize the feverish enterprise at the quarries and the fleet of barges choking the Nile. The logistics of the entire Great Pyramid operation truly boggles the mind. And we haven't even broached the subjects of housing, food, water, policing, sanitary facilities, and medical support. It is not uncommon in modern warfare for every front-line soldier to be backed by ten support personnel supported by mechanized infrastructure!

In this light, we might suggest that Payne was far off in his mathematics; but J. Davidovits and M. Morris made similar calculations and arrived at a figure of 52,500 workers, all toiling at the same time in a smallish area. (R8)

Herodotus was even more pessimistic. Based on what he learned on his visit to the Giza Plateau in 500 B.C., he asserted that a work force of 100,000 strong milled around the Giza site for 20 years. (R16)

More optimistic figures for the Great Pyramid work force have come from S.K. Wier. He examined the "energetics" of the Great Pyramid operation. This means that he considered the Great Pyramid to be "energy sink," with humans being the predominant energy suppliers.

The average amount of useful work that a man can perform in a day is about 2.4×10^5 joules---maybe rather more for an experienced worker. The potential energy of the completed pyramid, relative to ground level, is 2.5×10^{12} joules. Therefore, lifting alone would require at least 1.04×10^7 man-days, or 1,250 men over the 8,400-day schedule. [23 years assumed] This ignores quarrying, shaping and inefficiency. Nevertheless, it puts the issue into perspective: 1,250 men is not an outrageous work force for an Egyptian king. (R16)

Of course, 1,250 cannot be correct, but it is a lower limit---a very low one.

Wier next looked at the work forces in the quarries and transportation system. He assumed sledges were pulled over lubricated trackways and that a combination of levers and pulleys was used for lifting. Wier's final estimate for the total work force was 10,000, including the 1,250 at Giza. This would certainly have not been a burden for the Fourth-Dynasty's estimated population of $1\text{--}1.5 \times 10^6$. (R16)

Wier was not concerned about where his 10,000 men were going to stand. Indeed, he had them spread out from the work site to the quarries. Crowding would not have been critical if his numbers are on the mark.

Looking over the range of manpower estimates---10,000 to 50,000---we see that ancient Egypt certainly could have fielded the lower figure of 10,000, even assuming a 10-for-1 logistics support. The 50,000-worker estimate, however, balloons to 550,000, with logistics-support personnel added.

Standing room would definitely have been a concern if all 50,000 men of the upper estimate worked at Giza at the same time, especially for the force at the top of the pyramid, as it narrowed down to a small area at the 450-foot level.

The most indigestible number in the all of the foregoing calculations is the 2-minute, 17-second time limit per installed block. This we must flag as anomalous. Somewhere the assumptions are incorrect.

Modern field tests have only shown that humans can wrestle multiton stone blocks onto sledges and drag them a few feet. We would like to see a crew try to install these blocks at tiers several hundred feet high at the rate of one every 2 minutes, 17 seconds!

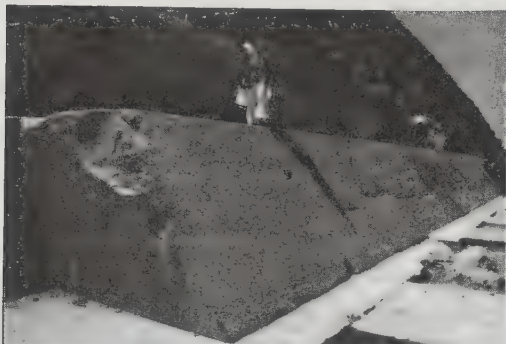
X2. Material shaping and fitting. The engineering problems associated with quarrying, hauling, and lifting the Great Pyramid's stone blocks must take second place to those involving the dressing and finishing of the blocks to close tolerances and then fitting them precisely together. As with the famed Inca stonework (MSB4), the Great Pyramid's stones fit together so exactly "that a knife blade cannot be inserted between them." Whereas abundant manpower was sufficient to explain how the blocks were quarried and transported to the Giza site, the fine-finishing and maintenance of close tolerances in Great-Pyramid construction have no such ready solution. In particular, the incredible precision seen in the pyramid's limestone casing stones and the granite slabs of the King's Chamber seem well beyond the capabilities of the tools available to Fourth-Dynasty stonemasons. While both limestone and granite blocks could have been rough-dressed at the quarries

simply by pounding them with harder rocks, such crude tools could not have produced the beautifully finished granite walls of the King's Chamber.

In truth, precision stonework is not seen everywhere in the Great Pyramid. Some of the interior masonry is sloppy and uncharacteristically rough. The floor of the Queen's Chamber, for example, seems to have been left unfinished for some reason. (A change in plans or perhaps a fact of mystical significance!)

We will focus upon three areas of the Great Pyramid where the stonework at least verges upon the anomalous: (1) the oddly and precisely shaped casing stones; (2) the high craftsmanship of the King's Chamber; and (3) the remarkable drilling operations that yielded the granite sarcophagus found in the King's Chamber.

The casing stones. It is regrettable that most of the Great Pyramid's casing stones seem to have been stripped away before they could have been studied by today's archeologists and construction engineers. In fact, before about 1830, it was generally believed that the pyramid had never been encased by a smooth layer of gleaming, polished limestone, as suggested in ancient writings. But in the 1800s, R. Howard-Vyse, while clearing away rubble from the bottom of the pyramid's north face, in attempt to find the true base of the structure, came across two undisturbed casing stones. The legends seem to have been correct: at least some of the Great Pyramid was covered with a sheer facing of limestone.



Some of the Great Pyramid's casing stones are still in place along the bottom of the structure. (Kadath, R9)

The casing stones may even have been painted, but that possibility is not an issue here. The stones that Howard-Vyse found were 12 feet long, 5 feet high, and 8 feet wide. (R1) Weighing 16-20 tons, they were much larger than the average pyramid core block. Being at the base, these casing stones may have been larger than those used above. We never know for certain how far up the casing stones extended or how large they were.

If, indeed, the entire Great Pyramid was encased and if the average casing stone tipped the scales at $2\frac{1}{2}$ tons, there were upwards of 100,000 of them. They would have covered an area of about 22 acres. (R1) It is important to note that these casing stones are of complex shape, smoothly finished, and firmly held in a very thin layer of cement of great strength and unknown formula.

Additional casing stones were located in the later 1800s by W.M.F. Petrie. It was Petrie who flagged one of the most important anomalies of the Great Pyramid, namely, the incredible precision exhibited by these stones. P. Tompkins remarked as follows about Petrie's measurements of the casing stones.

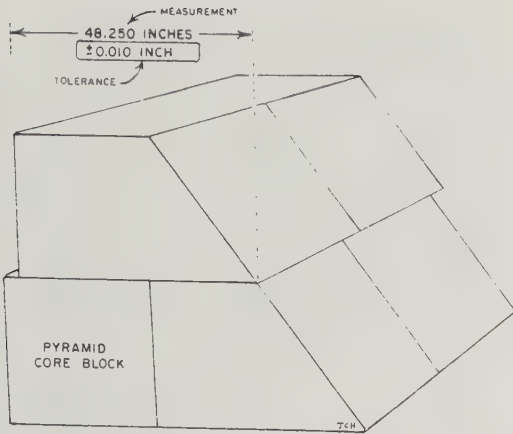
Eventually [Petrie] did manage to uncover more casing stones, as well as the base of the Pyramid. Petrie found the workmanship on the original casing stones, some of which weighed over 15 tons, quite as remarkable as Howard-Vyse had described it. The faces were so straight and so truly square that when the stones had been placed together the film of mortar left between them was on the average no thicker than a man's nail, or 1/50 inch over an area of 35 square feet.

Petrie found that the mean variation of the casings from a straight line and a true square was but 1/100 inch on a length of 75 inches. This staggering accuracy was equivalent to the most modern optician's straight edges. (R1)

Optical-precision in limestone using copper chisels? Seems unlikely!

Recently, C. Dunn, who is well-versed in precision engineering, is amazed at the ability of the ancient Egyptians to maintain such tight tolerances over such large areas. He wrote:

To manufacture just two blocks with a tolerance of .010 inch and place



Geometry of some of the Great Pyramid's casing stones. These large limestone blocks---some of which are 12 x 5 x 8 feet in dimensions---were fashioned with precision that would be hard to duplicate today. It is, in fact, difficult for us to accept C. Dunn's figure of ± 0.01 inch tolerance. (R17)

them together with a gap of no more than .020 inch is a remarkable feat. To manufacture and position over 100,000 similar blocks requires an industry that the ancient Egyptians are not credited with having developed. (R17)

Drawing upon his manufacturing experience, Dunn ridicules the claim that the casing stones are the product of crude stone hammers and copper chisels.

It is at least as difficult to imagine that one of these huge casing stones was fitted into place every 2 minutes, 17 seconds, or thereabouts!

We do not know how the Egyptians attained such precision, and that must be considered anomalous. But beyond that is the question of why they needed 0.010-inch precision. 0.25-inch tolerance would have been perfectly adequate---as it is in modern stonework. Perhaps it was just a quest for perfection. Who knows?

Whatever the reason for the unnecessary precision of the casing stones, the question of how it was achieved is far deeper and more important than how the stones were transported from the quar-

ries. Precision machining is "high" technology, whereas application of sheer muscle power is not.

The King's Chamber: precision in hard granite. To enter the King's Chamber, one must first pass through a curious anteroom. (MSP7). Strangely, the stonework here is on the sloppy side. The contrast with the finely finished King's Chamber just a few feet beyond is striking. As in the case of the unfinished floor of the Queen's Chamber, it is pertinent to ask if the differences in workmanship are symptomatic of some imperative we cannot discern or simply corner-cutting.

Once inside the King's Chamber, one is struck with what was accomplished 4,500 years ago with a stone as hard as granite. R. Bauval and A. Gilbert write:

Unlike the Queen's Chamber, which is lined with limestone, this is of smooth black granite brought from Aswan in Upper Egypt. Whoever was responsible for building it was a master mason indeed. The granite blocks which make up the walls and ceiling weigh about thirty tons each and are perfectly smooth-faced. No mortar was used in jointing but, as with the casing-stones on the outside of the pyramid, the blocks were so perfectly cut that a knife blade will not fit between the joints. Fine jointing such as this would have been difficult with large limestone blocks; with huge granite blocks, it is little short of incredible. (R14)

G. Hancock was impressed more by the logistics involved in achieving the megalithic stonework seen in the King's Chamber. Note that he assigns higher weights to the granite blocks than did Bauval and Gilbert.

The walls are composed on 100 separate blocks weighing around 70 tons each, and the ceiling is spanned by 9 further blocks each weighing 50 tons. The engineering logistics involved in creating such a chamber at a height of 150 feet above the ground are stupefying. (R15)

The sarcophagus in the King's Chamber: a possible manufacturing anomaly. A now-empty sarcophagus at the west end of the King's Chamber has perplexed arche-

ologists for centuries. It was empty when the Arabs reached the chamber, but was it always? In all probability, it was rifled by grave robbers thousands of years ago, but it is impossible to tell for certain. In any case, we are concerned here with the manufacture of this monolithic artifact. It was carved from a single block of hard, chocolate-colored granite from an as-yet-unfound quarry. Today, its rim is seen to be well-chipped by souvenir hunters. Look closer and you also see many rough scratch marks on the outside that contrast unfavorably with the finely finished walls of the chamber containing it. These external scratches are most likely saw marks. Inside, there are still more scratches. These seem to be the marks left by tubular drills that were used to excavate the interior of the sarcophagus. It is the latter set of tool marks that engender another manufacturing mystery.

Bear in mind that granite contains crystals of extremely hard quartz. Both outside and inside the sarcophagus, the Egyptian's tools had to cut through this obdurate material---something they apparently did with astonishing ease. Today's stone cutters attack granite with wire saws aided by silicon-carbide grit. It is this grit---almost as hard as diamond---that does the actual cutting in modern granite quarries. It is likely that the ancient Egyptians also employed hard grit to increase the cutting power of their copper saws and drills. Quartz sand might have been used, but diamond grit would have been better if the Egyptians had access to some. However, no grit of any kind has ever been found, nor have any of the postulated copper drills.

Without doubt, the most interesting manufacturing enigma associated with the sarcophagus is seen in the drill scratches. They imply that the tubular drills used in hollowing out the inside advanced 0.1 inch per revolution. This is, according to C. Dunn, an incredible rate even for the best of modern drills when working with granite. Today, 0.0002 inch per turn is average---500 times slower than the speeds the Egyptians apparently attained 4,500 years ago. (R15, R17)

Admittedly, these figures come from popular books, both of which advance radical theories concerning ancient Egyptian technology. The professional

literature so far examined in silent on these matters. These mundane engineering enigmas deserve more attention.

Dunn bolsters the case that some sort of advanced stone-working technology existed in the Fourth Dynasty by describing granite artifacts to be seen in Egyptian museums. Tool marks are clearly evident on some specimens. Some appear to have been turned on lathes! That lathes capable to machining granite were available 4,500 years ago sounds preposterous. What super-hard cutting tools did they have? Diamond-tipped? (R17)

Reasonable explanations will probably be found eventually that will account for the remarkable stone-working abilities of ancient Egyptians. At present, these answers elude us, and we must rate these capabilities as anomalous.

Poured pyramids? We would be remiss if we failed to mention a radical theory that sidesteps many of the practical difficulties the Egyptians would have encountered in obtaining, handling, precision-shaping, and close-fitting hard stone. In 1979, French chemist J. Davidovits seriously proposed that some, perhaps most, of the limestone blocks seen in the Great Pyramid and other ancient structures were not quarried from nature at all. Rather, he maintained, they were cast in wooden molds using a slurry of crushed limestone and a geopolymer binder. Within hours, Davidovits insisted, this mixture would harden into smooth-faced, precisely dimensioned blocks indistinguishable from laboriously quarried and dressed natural limestone. (R7, R8)

Unlikely though the idea of casting pyramid blocks may be, Davidovits assembled an impressive list of observations supporting his claims. These seem to undermine the prevailing confident assertion that only natural limestone can be found in the Great Pyramid and contemporaneous structures. A portion of his list follows with references.

- Some of the limestone blocks contain air bubbles that would not be expected in natural rock. (R7, R11)

- Casing stones contain up to 13% geopolymeric binder. (R7)

- Casing stones appear to have a millimeter-thick "skin" of pure geopoly-

mer binder. (R7)

- Translations of ancient Egyptian inscriptions suggest that stone blocks were "poured." (R13)

- The notable absence of cracked and spoiled natural limestone blocks at the quarries favors an artificial origin. (R8)

- Pyramid blocks have an unusually high moisture content, as would be expected if they were "poured." (R8)

- Natural Giza limestone displays stratification, but the Great Pyramid blocks do not. (R8)

- The Great-Pyramid blocks are quantized in their dimensions, implying the use of standard molds. (R8)

- The Egyptian quarries were apparently not worked before 1659 B.C. ---well after the construction of the Great Pyramid. (R8)

- Some stone blocks in Khafra's pyramid are spongy and show "lift lines" marking the separations between batches of slurry. (R8)

- Organic fibers and isolated limestone chunks are seen in some blocks. (R8)

- Some limestone blocks contain minerals not found in quarry limestones. (R8)

- The salient mystery of the sliding plugs in the Ascending Passage (MSP7) would be solved if the plugs had been cast inside the Great Pyramid. (R8)

Needless to say, Davidovits' long parade of anomalous claims (anomalous because they contradict accepted ideas) did not sit well with professional archaeologists. The "poured-pyramid" theory attracted considerable comment in both amateur and professional circles. Curt dismissals were immediate in the professional journals. The most significant of these came from chemists and geologists who took limestone specimens from the Egyptian pyramids into their laboratories for testing. As can be seen below in two quotations, Davidovits' hypothesis was vigorously rejected by the scientific community on the basis of these tests.

No evidence to support the theory of a cast-in-place origin for the blocks of the pyramids and associated structures was found during our site investigation or by laboratory analysis. Stratification and mineralogy of the pyramid and temple stones, we believe, can be reasonably interpreted in no other way but geologic. No evidence of geopolymeric binder, or tell-tale signs of casting-in-place were found. ...Examinations with the ordinary petrographic microscope, using thin sections and powerful mounts, a scientific technique that Davidovits and Morris [R8] do not apparently appreciate, reveal nothing even remotely suggesting a geopolymeric component. The results of X-ray diffraction, differential thermal analysis, scanning electron microscope, inorganic chemistry, and, equally important, on-site examinations at Giza and Saqqara indicate, without doubt, the geologic origin of the stones. (R12)

And from the authoritative Journal of Archaeological Science:

Several samples of pyramids from Giza were obtained. The samples were analyzed by scanning electron microscopy, electron diffraction by X-rays [sic], powder X-ray diffraction, inductively coupled plasmography, Fourier-transform infrared spectroscopy and other techniques. Some scientists who have recently studied the pyramids have suggested that the pyramids were poured into place, stone by stone. The prevailing theory among Egyptologists is, of course, that the pyramids were built from blocks of natural stone. All of the results obtained during this study directly support the concept that the pyramids are made of limestone and are not cementitious in nature. (R13)

The two foregoing, very severe critiques do not address several of Davidovits' specific claims in the long list compiled above. For example, is the claim that the quarries were not worked during the Fourth Dynasty correct?

Although the critiques are selective, they are very convincing. The "Davidovits matter" has been officially disposed of as far as science is concerned. Even

for avant garde thinkers, the "poured-pyramid" theory is badly damaged.

X3. Whole-structure enigmas. Before turning attention to the many puzzles residing inside the Great Pyramid's ponderous bulk (MSP7), we must attend to four potentially anomalous observations related to the engineering of the Great Pyramid as-a-whole. The last three of these phenomena are rarely mentioned in the multitudinous books devoted to the pyramids and ancient Egypt. Yet, these "minor" facts are almost certainly more anomalous than the oft-discussed, but lesser, problem of hauling stone blocks to the site of the Great Pyramid.

Precision orientation of the base of the Great Pyramid. In his book Fingerprints of the Gods, G. Hancock asserts that the precise orientation of of the base of the Great Pyramid is "inexplicable" and "almost supernatural." (R15)

Unquestionably, the base of the Great Pyramid was laid out with incredible precision with respect to the cardinal points of the compass. But today's astronomers assure us that, even 4,500 years ago, this precision was attainable without modern instruments. Astronomer E.C. Krupp holds this opinion.

Sheer size qualifies the Great Pyramid as "great," but its architectural details make it unique. First, whatever else may be hypothesized about the pyramid, there is no doubt that it is aligned astronomically, and with extreme precision, the four sides of its immense base (covering more than 13 acres) running north, south, east and west. The worst agreement of any side with exact cardinal orientation is on the east, and even there the misalignment from a true north-south line is but $5\frac{1}{2}$ arcminutes. The other three sides agree even better. Accuracy of this sort is possible, even with very simple techniques, provided that care is taken in setting out the lines. Preserving this accuracy on the monumental scale of the Great Pyramid, however, means not "twisting" the sides at higher levels, and the Egyptians' success is impressive. The corners of the base are very nearly

right angles, and the entire base is almost a perfect square. The greatest difference in length between any two sides is 7.8 inches. This accuracy emphasizes the concern the builders had for the four cardinal directions, what the Pyramid Texts of the later Fifth and Sixth Dynasties call the "pillars" of the sky. (R4)

G.S. Hawkins, also an astronomer, believes the pyramid's alignment was accomplished by taking careful sightings on prominent stars as they rose in the east and set in the west. Due north would be the midpoint on the northern horizon between these sightings. He admits, though, that however it was done, "they pushed those measurements to the very limits of the accuracy and precision of their day." (R5)

Astronomers, it is seen, do not question the ability of the Egyptians to achieve such precision. But, some have wondered, why did they bother?

Such extreme precision was not essential to the construction of the Great Pyramid. It is certainly not required in modern building construction. We see the same passion for precision in the Great Pyramid's casing stones and the straightness of the long Descending Passage. The only answer to this passion for precision seems to be that the builders of the Great Pyramid were driven not by engineering practicalities in these matters but rather by subjective imperatives and/or mystical constraints.

The crease in the pyramid and the eclaire phenomenon. The meticulous measurements of the Great Pyramid made by W.M.F. Petrie brought to light a most peculiar feature of this structure. As the pyramid stands today, stripped of most of its casing stones, each of its four faces is slightly indented or "creased." The indentation in the north face is only about 37 inches. This strange depression is not noticeable to the casual observer. It is also pertinent that Petrie did not detect any corresponding indentation in the casing stones still in place along the base of the pyramid. (R1) It is possible, then, that the higher casing stones (now missing) could have been shaped to remove the indentation, or they could have made the crease even more pronounced. We will never know.

The indentation could have been deliberate for some unrecognized engineering reason. It might also be the consequence of the natural settling of the structure or the compaction of the limestone core blocks over four millennia. We might have been able to resolve the question of intent if the casing stones were still in place.

One consequence of the indentation of the pyramid faces is a curious light-and-shadow effect. Indeed, this phenomenon is so unusual in its timing that it can hardly be accidental. It reinforces the claims that the indentations are purposeful.

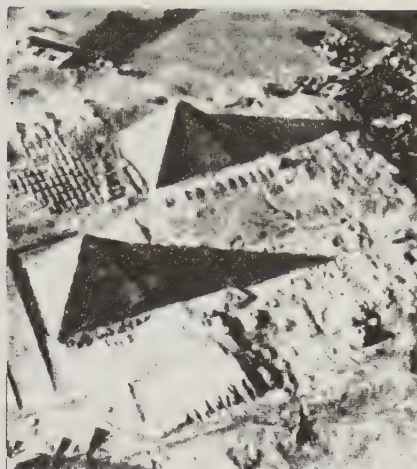
Called the "eclair" or "flash" phenomenon, it is seen only on the southern face and is best appreciated in aerial photographs. At certain times of the year, for just 4 minutes, exactly half of the southern face is in shadow while the other half is bathed in full sunlight. The crease or indentation in this face of the pyramid is striking during these few minutes. Suddenly, in about 20 seconds, the shadow races across the sunlit half of the face, and the phenomenon is complete. (R9)

The aerial photographs are emphatic that the indentation is really a well-defined crease running from top to bottom of the pyramid face. J. Gossart states that the dihedral angle of the crease is about $179\frac{1}{2}^\circ$. Furthermore, he adds that the eclair phenomenon is seen only on the equinoxes and summer solstice. At the solstice the phenomenon is said to occur twice, at 06:40 and 17:20! (R9)

It seems unlikely that the same phenomenon could occur at both the equinoxes and summer solstice.

If the eclair phenomenon is really tied to the equinoxes and/or summer solstice, the existence of the crease would seem to be deliberate, but we can never be sure, especially when those casing stones are missing. One can also ask why the other three faces of the Great Pyramid are also indented, when the eclair phenomenon could never occur there.

Adding to this mystery is the fact that similar light-and-shadow effects can be seen on the steps of the Temple of Kulkulcan at Chichen Itza---again on the equinoxes" (MSP1-X2), and also at Teotihuacan's Pyramid of the Sun---once more only on the equinoxes (MSP4-X3). Any transoceanic cultural connection



Aerial photograph illustrating the "crease" in the southern face of the Great Pyramid as accentuated by sun and shadow. The crease produces the so-called "eclair" effect.

seems unlikely due to time and distance gaps.

Perhaps all three light-and-shadow phenomena are purely unintentional, and suspicious anomalists make too much of them.

Curious changes in block sizes. One would expect that wise pyramid builders would place the largest blocks on the lower tiers, if only to reduce the lifting problems. This expectation is met at Khafre's pyramid, adjacent to the Great Pyramid. There, the lower courses boast 500-ton blocks. In fact, these blocks are so large compared to the blocks of the higher tiers that some suspect that a different, perhaps much older, culture built this megalithic foundation for a purpose other than that of Khafre's tomb. (MSP1-X5) But the Great Pyramid is different. Its largest stone blocks are located 100-feet high at the 35th tier. The blocks there run 10-30 tons compared to the pyramid's average of 2.5 tons. Interestingly, the very largest stones, hundreds of them, are found right at the level of the King's Chamber concealed deep inside the pyramid. There must have been some logic to this unusual, seemingly impractical, distribution of blocks, but we cannot divine it. (R8, R15)

High moisture content of the limestone core blocks. Egypt's climate is very dry at Giza, so visitors to the Great Pyramid are surprised to discover high humidity levels in the chambers and passageways of this structure. Apparently, this dampness derives from moisture residing in the limestone blocks. This surmise was confirmed in 1974, when scientists tried to probe the pyramid's interior with electromagnetic sounding equipment in a search for undiscovered chambers. The electromagnetic waves did not penetrate very far into the limestone blocks because they were absorbed by moisture within them. Unfortunately, this unexpected water content effectively ended the search for hidden chambers. It did, however, add the "moisture mystery" to the Great Pyramid's long dossier of puzzles. (R3, R8)

So, whence the moisture? The limestone bedrock of the Giza Plateau, from which many of the pyramid's core blocks were quarried, is said to be much drier. In truth, we have seen no data confirming this assertion.

As one would expect, J. Davidovits seized upon this unexpected moisture content of the core blocks as support for his theory that these blocks were actually poured into molds, using limestone slurry and geopolymers. (MSP6-X2) An even more radical notion blames the moisture content upon the Biblical Flood, or possibly a massive marine incursion within historical times. Another intriguing connection involves the strange salt encrustations found on the walls of the Queen's Chamber and at a few other spots within the Great Pyramid. (MSP7-X5) One can also speculate that the blocks' water content was added during lifting operation employing hydraulic machinery during pyramid construction.

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MSP7 Enigmatic Structures within the Great Pyramid

Description. A chamber-by-chamber, passage-by-passage, review of the many puzzles posed by the complex interior of the Great Pyramid, as identified below under Anomaly Evaluation.

Data Evaluation. Unfortunately, we have had to rely primarily upon popular sources in this section, mostly books and newspaper articles by nonprofessionals. The major exception is The Pyramids of Egypt by I.E.S. Edwards, a well-known authority. We have tried to reflect the nature of our sources in the data evaluations. This said, the basic dimensions and configuration of the Great Pyramid have been well known for centuries. In this light, our popular sources are considered reliable in general.

We have selected for our usual cursory analysis eleven curiosities and potential anomalies that we deem most important. The data ratings for each are the first figures in the evaluations.

Anomaly Evaluation. We list below the eleven above-mentioned curiosities and potential anomalies associated with the internal structures of the Great Pyramid. The anomaly ratings are the second figures in the evaluations.

- The unknown purpose and users of the well-shaft and grotto. It is quite possible that the Great Pyramid was entered and looted via the well-shaft before entrance was gained by Al Mamun's men in 820 A.D. using brute force (X1). Evaluations: 2/1.
- The unknown purpose of the subterranean chamber and pit, including the possibility that Khufu's real tomb may be located deeper beneath the rubble in the pit (X2). Evaluations: 3/2.
- The unknown purposes behind the high-ceilinged Grand Gallery with its peculiar corbelled cross section and those mysterious ramps and notched holes (X3). Evaluations: 1/2
- Our ignorance of where the granite plugs blocking the Ascending Passage were stored before they were slid into place, assuming that this is what actually happened (X4). Evaluations: 3/2.
- The apparent physical impossibility of sliding the granite plugs down the Ascending Passage due to the tight fit and consequent friction (X4). Evaluations: 2/3.
- The purpose of the Queen's Chamber, which seems to have never been finished; i.e., the rough floor may have been intentional (X5). Evaluations: 2/2.
- The existence of a layers of "salt" on the walls of the Queen's Chamber and elsewhere in the Great Pyramid (X5). Evaluations: 1/2.
- The unknown purpose behind the complex system of "relieving chambers" above the King's Chamber. These are superfluous from the standpoint of structural engineering (X6). Evaluations: 1/2.
- The unknown sources of the black dust deposits in one of the relieving chambers of the King's Chamber and just outside the newly discovered door in one of the "air shafts" of the Queen's Chamber. These dust deposits are probably organic in nature, but how they reached their present positions are mysteries (X6). Evaluations: 2/3.

- The "real" purpose(s) of the "air-shafts" located in the walls of both the Queen's Chamber and King's Chamber. One of the former ends in a door of some sort (X5, X6). Evaluations: 3/1.
- The unplumbed purpose of the sand-filled cavities located within the body of the Great Pyramid behind the limestone core blocks (X7). Evaluations: 2/2.

Similar and Related Phenomena. The tunnel under the Pyramid of the Sun at Teotihuacan (MSP4-X5); the hidden tomb in Palenque's Temple of the Inscriptions (MSP3-X2).

Entries

X0. Introduction. Archeologists have probably not found all of the internal features of the Great Pyramid. That this is so is proven by the strange "door" found recently blocking one of the so-called "air-shafts" leading away from the Queen's Chamber. (X7) Nevertheless, although many have searched diligently, no major hidden chambers or passages have been discovered within the Great Pyramid during the last century. Even so, those internal structures we do know about present us with a very long list of unanswered questions. In fact, no manmade structure bequeathed us by the ancients holds more secrets---not even Stonehenge or Tiahuanaco.

In this section, we review some of the most enduring puzzles posed by this great mountain of stone blocks, beginning with a feature that was not found by archeologists until the Seventeenth Century A.D.

X1. The well-shaft and grotto. Most of the Great Pyramid literature assumes that the Arab king Al Mamun broke into an unluted tomb in 820 A.D. True, the sarcophagus in the King's Chamber was unoccupied and no riches were found, but neither were there signs that anyone else had preceded Al Mamun's men. In fact, the location of the pyramid's formal entrance had already been lost in time, so the Arabs were forced to hack their way into the pyramid through the side of this imposing structure. And when they finally came upon the Ascending Passage, they found that it was still sealed tightly by formidable granite plugs. It seemed that no one had preceded them and that they would find great treasures beyond the granite plugs that dulled their tools.

Chopping their way around the plugs through the softer limestone of the pyramid's core, they finally gained access to the inner chambers and passages. But to their chagrin, they found that the Great Pyramid contained nothing worth stealing---nothing but enigmas, that is, and they cared little for them. Al Mamun then ceased his attack on the Great Pyramid.

Without a mummy and grave goods, was the Great Pyramid really intended to be a tomb? Or was it something else? The Great Pyramid then became the subject of intense speculation---and it still is today! Rather than a tomb, was this immense edifice intended instead to be a repository of ancient knowledge destined for later cultures astute enough to gain entrance and read its arcane messages? Or was it really a sophisticated astronomical observatory; or perhaps even a colossal, high-technology powerplant (a recent suggestion)?

Such radical speculations would quickly fade away if it could be demonstrated that the Great Pyramid had really been plundered millennia ago, as had all of the other Egyptian pyramids. This possibility does exist, even though Al Mamun's men found the Ascending Passage tightly sealed. There is a third way to gain entrance to the Great Pyramid; a way separate from the formal entrance and the two bypasses chopped out under Al Mamun's orders.

This obscure entrance was almost discovered by J. Greaves in the early 1600s. At the foot of the Grand Gallery leading to the King's Chamber, he noticed that a stone block (which has never been found) apparently had been forcibly removed from the ramp. This was inferred from a fragment of it that was still cemented to an adjacent block. At this spot, Greaves discovered a shaft

that led straight down through the lower courses of the pyramid into the bedrock of the Giza Plateau. Greaves lowered himself through the 3-foot-wide aperture and descended about 60 feet through what is now called the "well-shaft" to a rough chamber carved out of the Giza bedrock now named the "grotto." Bad air and the swarms of bats then drove Greaves back up the well-shaft and on to other, more agreeable, areas of the pyramid.

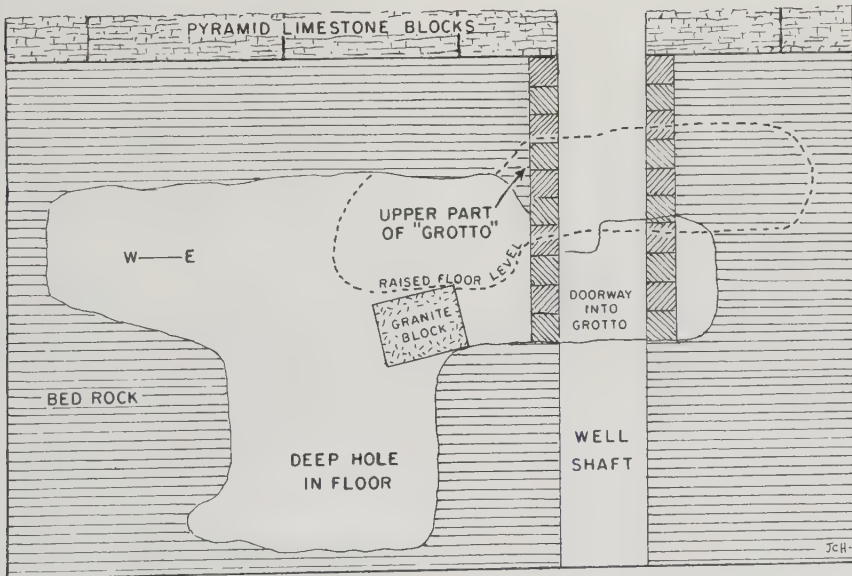
The deeper exploration of the well-shaft waited until the Nineteenth Century, when G.B. Caviglia descended 125 feet beyond and below the grotto. At this point, further passage was blocked by debris. Undeterred by the terrible working conditions, Caviglia and his workmen cleared out the rubble and finally broke into the Descending Passage. (R1)

It has long been known that the Descending Passage had been discovered at least 2,000 years ago. The Greek geographer Strabo had mentioned it, and Roman graffiti is in evidence in the so-called "subterranean chamber" (X2)

located at the lower end of the Descending Passage. With a connection now established between the well-shaft and the Descending Passage, it became obvious that the Great Pyramid could have been looted in centuries past---long before Al Mamun---via the well-shaft, although this would have been very difficult due to the narrowness of the well-shaft.

But if the Great Pyramid had been robbed in ancient times, why was the well-shaft sealed with debris? Particularly if there was nothing left to steal! An even more interesting question is: Just how was all that debris inserted into the well-shaft? It would have been next to impossible from below, and no one was left above to seal the well-shaft from that vantage point.

One must also ask why the well-shaft was built in the first place. Since its upper part is lined with fine masonry, it must have been on the drawing boards of the pyramid builders. I.E.S. Edwards supposes that its purpose was as the escape route of the last of the workmen who sealed off the Ascending Passage



The curious "grotto" is accessible from the well shaft. Its significance is unknown as is the purpose of the huge granite block teetering on the edge of the deep hole in the floor. The block has drill holes in it that make it even more mysterious.

with those sliding granite plugs (X4) at the juncture of the Ascending Passage and Descending Passage. (R2) Offhand, this seems a reasonable explanation for the purpose of the well-shaft. Still unexplained, however, is the apparent forced removal of a ramp stone at the top of the well-shaft. The exiting workers would hardly have been able to do that. We have no clue as to who actually sealed the opening of well-shaft with masonry or when. Neither do we know who used brute force to reopen it and then block the well-shaft with debris.

In the end, we cannot tell who used the well-shaft and for what reason---perhaps it saw several sets of visitors. The original builders must have had some purpose in mind, because they designed and built it. Grave robbers may have found it, but would they have sealed it with all that debris?

A final puzzling feature of the well-shaft and associated grotto is the presence in the grotto of a large, drill-holed granite block at the edge of a deep hole in the grotto's floor. This block has no obvious purpose, and no one has any idea as to how it got there. (R1)

X2. The subterranean chamber and pit. The Descending Passage terminates in an unfinished chamber roughly hewn out of solid limestone. This large cavity in the Giza bedrock is called the "subterranean chamber" for obvious reasons. It lies about 150 feet below the base of Great Pyramid and is located very close to the pyramid's vertical axis, a fact suggesting it had a purpose more important than its crude construction betokens. Beyond the subterranean chamber a very narrow passage stretches 53 feet through the solid limestone before ending in a blank wall.

The subterranean chamber bears the signatures of ancient torches and is marked by Roman graffiti. It looks as if it was planned as a tomb but was abandoned before completion---perhaps in favor of a burial chamber in overhead in the pyramid proper. Actually, the burial chambers in most other Egyptian pyramids are subterranean; that is, carved out of the natural bedrock and on the vertical axis of the manmade pyramid above. In this arrangement, the pyramid serves more as a giant tomb-

stone rather than a crypt. But, the Great Pyramid is different in so many ways, we should not be surprised at a deviation from the norm. (See general diagram of the Great Pyramid in MSP5.)

Whatever the reason for the "ap-parent" change of plans, no one has ever found anything in the Great Pyramid's subterranean chamber despite considerable digging. But, there has always been a suspicion that the pyramid builders have intentionally misled us by directing our attentions to the more sophisticated chambers and passageways in the pyramid proper above. The subterranean chamber may be more than it seems to be, as suspected by N. Gholson.

The center of the chamber floor contains a cutout of a roughly rectangular pit. This pit is also cut in several levels like the chamber floor. In 1838, this pit measured twelve feet deep, but it was later deepened by explorer Howard-Vyse in his search for a lost chamber in the pyramid. After this explorer's futile search, it was immediately assumed that the pit held nothing of value. This conclusion, however, may have been overly presumptuous. The layers of refuse and stone that Howard-Vyse did not excavate could possibly conceal granite plugs blocking the entrance to another chamber---and possibly the true burial chamber of Khufu. Putting a huge stone slab over an entrance from above and filling the passage to the plug with rubble was a common Egyptian method of disguising tombs. (R3)

In this view, the Queen's Chamber and King's Chamber high up in the pyramid would be only decoys! Khufu's real tomb could be somewhere near the subterranean chamber---or still hidden elsewhere.

X3. The Grand Gallery. Like so many of the Great Pyramid's features, the Grand Gallery, which slants steeply upward toward the King's Chamber, seems alien in the sense that its design appears to be unrelated to the purpose we have assigned to it; that is, as a simple passageway for workmen and the culminating funeral procession. The Grand

Gallery is not at all consistent with the easy passage of humans. Al Mamun's men found it virtually impassable in 1820 A.D. Railings have now been installed for the crush of tourists, but in the absence of steps or railings, one cannot imagine a dignified funeral procession making its way up the steep Grand Gallery to the King's Chamber, the entrance to which is further blocked by a 3-foot-high stone step. The Grand Gallery's complete purpose is therefore obscure.

This said, the Grand Gallery's architecture is bold, splendid, striking, and novel. It could have been designed by a modern avant garde architect. It is almost beyond description. But P. Tompkins made the attempt in his Mysteries of the Great Pyramid.

The overall length of the Grand Gallery is 157 feet. It is inclined 26° , as is the Ascending Passage. The walls are 28 feet high, rising vertically in seven courses of polished limestone, each corbeled 3 inches toward the center, making the gallery narrow from 62 inches at the base to 41 inches at the top. The first corbeling is 7 feet high.

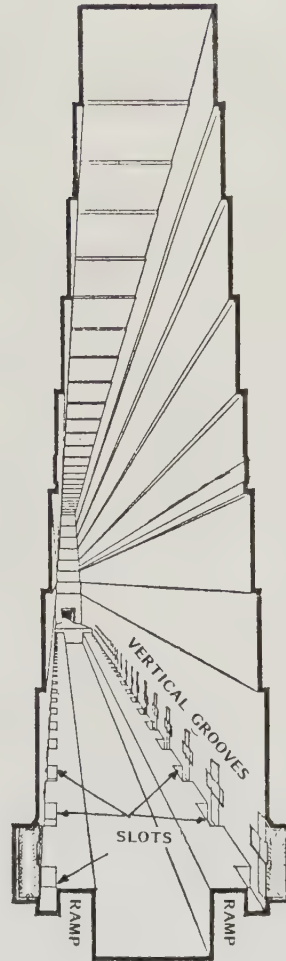
On either side of the central 2-foot passage are two ramps 18 inches wide and 2 feet high; along the walls is a series of notches. (R1)

Tompkins adds that the purposes of the ramps and notches are unknown.

Several other questions arise when one looks carefully at the Grand Gallery. Why is it so high if it is merely a passageway? Why was it made so difficult to traverse if it was serve only for the final funeral procession? Why has it precisely the same slope as both the Ascending Passage and Descending Passage?

The eerie nature of the Grand Gallery and the impression that it had (or has) purposes not yet divined are evident in the following quotation from R. Bauval and A. Gilbert.

Although the Grand Gallery is now easier to explore, it is still overwhelmingly mysterious, especially when one realizes that this curious room was ancient even in the days of Antony and Cleopatra. The walls are corbelled so that the Grand Gallery becomes narrower towards its ceiling, and its cross-section design seems to



An isometric view of the Grand Gallery. Its strange corbelled walls are 28 feet high---seemingly unnecessarily high for human passage. The floor slants upward at 26° , making access to the King's Chamber difficult. The purposes of the ramps, the slots, and the grooves along the sides are unknown.

echo the curious niche inside the Queen's Chamber, also corbelled. As with so much Egyptian architecture, it looks so ancient that it seems almost modern. There is a quasi-inhuman quality about the Grand Gallery that is hard to explain, as though it were not intended for peo-

ple to walk up and down but to serve some other specialized or specific function. Many have remarked that the Grand Gallery looks like part of a machine, whose function is beyond us. (R8)

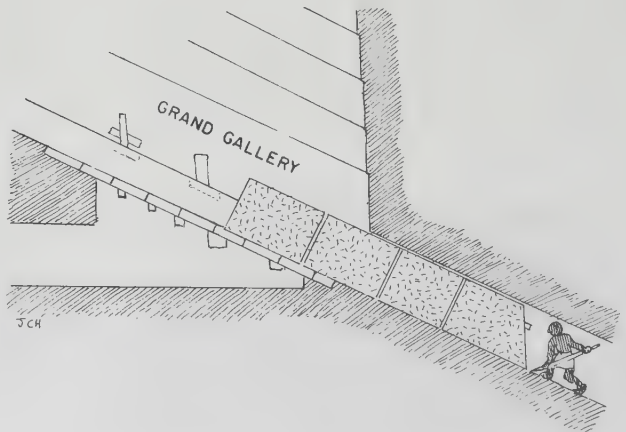
A "machine"? Surely, that is going too far! It implies a precocious knowledge of physics and chemistry. Yet, the Grand Gallery is an integral part of the "Giza Powerplant" proposed recently by C. Dunn. (R10)

Actually, the Great Pyramid and its many almost-alien features have engendered speculations that the structure's builders were precociously versed in advanced science and technology. Of course, legendary Atlantis is usually cited first as the probable source of this advanced knowledge, which has since been lost in the mists of time. Next in popularity are extraterrestrial sources of science and technology. Such notions prosper because we find it difficult to give proper credit to ancient indigenous cultures for their innate intelligence and social organization. If their structures appear enigmatic to us, it is more likely because we have such a different view of the cosmos---different aesthetic principles and other gods to please---and design our modern buildings accordingly. To the ancient Egyptians, the Grand Gallery was doubtless perfectly reasonable, comprehensible, and beautiful. On the other hand, they would have certainly thought our automobiles and computers to be of alien origin and beyond human understanding.

X4. The mystery of the granite plugs. The lower end of the Ascending Passage had been blocked for some 4,500 years by at least three massive "plugs" of red-and-black granite. At least they appear to be plugs to us, for they sealed off the Ascending Passage, Grand Gallery, Queen's Chamber, and King's Chamber from those who gained access to the Descending Passage---assuming that they did not know of the well-shaft. Al Mamun's men, however, were not deterred by the plugs; they simply cut their way around them through the softer limestone core blocks only to encounter a row of limestone plugs behind the granite plugs. How many they found, we will never know, because the Arabs easily demolished them and removed the debris. After the last limestone plug was excised, they had clear access to the remainder of the Ascending Passage, the Grand Gallery, and the chambers beyond. To their dismay, they found no riches---really nothing at all. Either the Great Pyramid had been ransacked ages before them via the well-shaft, or it had never contained anything of value to grave robbers. All the inner chambers and passageways of the Great Pyramid were eerily devoid of artifacts, the usual Egyptian hieroglyphs, and even any valueless remnants disdained by thieves and tools dropped by careless workmen.

The emptiness of the Great Pyramid is in itself strange, but those granite plugs pose a different kind of mystery---one of logistics. The prevailing assumption is that the granite plugs were stored somewhere inside the pyramid during its construction and remained

It is supposed that the granite plugs that sealed off the Grand Gallery and King's Chamber were slid down the Ascending Passage and into place by the last of the workmen, as shown. But where were these massive plugs stored before this (supposed) final closure of the pyramid? (R1)



there until the pharaoh was properly interred. Then, they were moved to the top of the Ascending Passage and slid down it into their present positions. They could not have been inserted and shoved up into place from the junction with the Descending Passage because they are an inch wider than the mouth of the Ascending Passage. But sliding them down the Ascending Passage also has its problems.

(1) Where were they stored inside the Great Pyramid so that they could be easily installed and yet not interfere with the assumed funeral?

(2) How did the workmen who slid the plugs into place escape? The Egyptians of the Fourth Dynasty did not usually immure humans along with their pharaohs. (R2) Nor have any skeletons ever been found inside the Great Pyramid.

The answer to the first question has been elusive because the entrance to the Queen's Chamber is too small for the plugs to have been stored there. The King's Chamber is eliminated for the same reason. There was plenty of room in the Grand Gallery, but how would the funeral procession get around them if they were stored there? One scenario has the plugs suspended high up in the Grand Gallery, held in place by wooden beams. At the proper time after the pharaoh's interment, they were lowered and slid down the Ascending Passage. Other similar scenarios have been devised, although no consensus exists as to which is correct. (R1)

As for the second question, the workers left behind might have escaped down the well-shaft. But, if so, who introduced all the rubble into the well-shaft? It could hardly have been done from below.

The conundrums continue. Why, for example, didn't the builders simply plug the Descending Passage, a task easily accomplished from the outside?

Finally, elementary physics intrudes. The clearances between the granite plugs and the walls of the Ascending Passage are only $\frac{1}{2}$ inch on either side and $1\frac{1}{2}$ inches at the top. (R1) (C. Dunn asserts that he found no clearances at all between the plugs and passage walls.) (R10) Furthermore, the limestone walls of the Ascending Passage are rather

rough, producing a high coefficient of friction. Even with the use of a lubricant, it is questionable whether the multiton granite plugs could have been slid 129 feet---a goodly distance---down the passage to their present positions.

It is possible that the granite plugs were never slid into position but were installed in their present locations while the pyramid was under construction. (R9) Supporting this contention, Dunn notes that some of the granite comprising the plugs is still firmly cemented to the floor of the Ascending Passage. (R10) Why would the pyramid designers have installed non-functioning plugs? As a ruse, perhaps, to decoy would-be robbers away from the real tomb by making them think that great riches lay just beyond the plugs. The ploy, if that is what it was, certainly worked with Al Mamun's forced entry.

X5. The Queen's Chamber. The so-called "Queen's Chamber" is located almost precisely below the apex of the Great Pyramid, as is the subterranean chamber. (X2) (The King's Chamber is not on this vertical axis for some reason.) Entrance to this smallish room is gained through a low (only about $3\frac{1}{2}$ feet high), horizontal passage, 127 feet long, that begins at the at the upper end of the Ascending Passage. When Al Mamun's men entered it---probably its first visitors in 2,000 years---they noted its peaked ceiling and similarity to the burial chambers built for Arab queens and gave it its present name. No queen ever occupied it. The room was bare, like the rest of the pyramid's interior.

In dimensions, the floor of the Queen's Chamber measures 18 feet, 10 inches, by 17 feet, 2 inches. Its double-peaked ceiling is 20 feet, 5 inches high at its peak. (R1)

The chamber's walls consist of beautifully finished limestone blocks. In stark contrast, the floor is rough and unfinished, very uncharacteristic of the pyramid builders. The "abandonment" theory of the Great Pyramid suggests that the Queen's Chamber was chosen to be the actual tomb of the pharaoh ---after the subterranean chamber site was dismissed---but then it, too, was abandoned before completion in favor of

the King's Chamber higher up in the structure.

Actually, it is hard to believe that the Queen's Chamber was truly designed as a pharaoh's tomb. For one reason, a stately funeral procession could hardly proceed with any dignity down a 127-foot-long passage while crouching under a ceiling only 3 feet, 9 inches high. As a matter of fact, the true purpose of the Queen's Chamber is debatable, as it has been for centuries.

For the anomalist, the Queen's Chamber offers three more puzzles.

The strange niche. Into the east wall of the Queen's Chamber is carved a curious niche 3 feet, 5 inches, deep. What, if anything, ever occupied the niche is a mystery. Archeologists posit that it was intended for a statue of the deceased pharaoh, but this is just a guess. The cross section of the niche, however, closely matches that of the corbelled Grand Gallery. This pattern is so unusual that one suspects some unplumbed, perhaps mystical, symbolism exists at both locations.

The "salt" layer. Even more intriguing than the niche is the $\frac{1}{2}$ -inch layer of "salt" found adhering to the walls of the Queen's Chamber. The same incrustation was found along the horizontal passage leading to the chamber and also along the lower portion of the Grand Gallery. Analysis of this substance revealed it to be a mixture of calcium carbonate, ordinary salt, and gypsum. (R10)

It is strange that only certain portions of the Great Pyramid's interior were so-encrusted. This has led to radical theories. One is that these areas were salt-water-filled during the Biblical Flood! (However, the Descending Passage, which would also have been immersed, is not encrusted at all.) More recently, C. Dunn claimed that the encrustation was deposited when the Great Pyramid was operated as a huge power plant and hydrogen gas flooded the salt-covered areas! (R10)

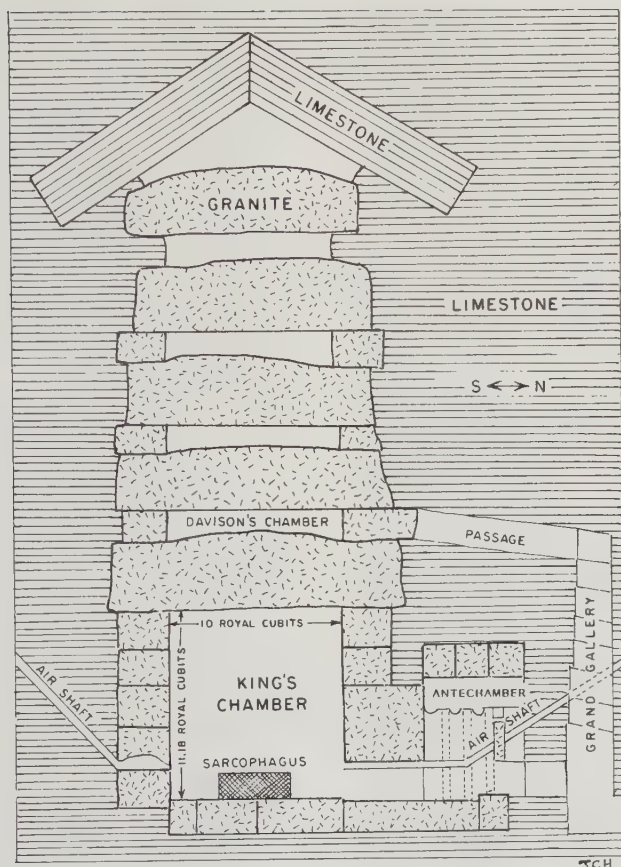
More realistically, the "salt" layer may have exuded from the limestone walls. It is not all salt (NaCl) but also contains the calcium carbonate that makes up most of the limestone matrix. Such an exudate may also be associated with the alleged excess moisture in the limestone core blocks.

The big step. Lastly, a minor mystery is the appearance of a steep step, 2 feet down, in the horizontal passage that leads into the Queen's Chamber. It not only impedes access to the Queen's Chamber but also seems purposeless and is offensive to our modern idea of orderliness. As so often in the Great Pyramid, we can only label it "purpose unknown."

X6. The King's Chamber. It is the King's Chamber that most excites the imagination of archeologists and tourists alike. Here is a magnificent room enclosed by ponderous walls built from almost 100 finely finished granite blocks, each weighing about 70 tons. The ceiling is likewise massive: nine 50-ton granite slabs. The ceiling is flat, like those in the tombs of Arab kings, thus its present name. Overall dimensions: 34 feet long, 17 feet wide, 14 feet high. The entrance to the King's Chamber is located at the upper end of the Grand Gallery. Unlike the Queen's Chamber and the subterranean chamber, it is not on the pyramid's vertical axis. Given the pyramid-builders' penchant for geometrical order and precision, this offset location is surprising. It had to be intentional, but why?

The grandeur of the King's Chamber and the presence of a sarcophagus encourages one to conclude that a pharaoh was indeed entombed here. But the chamber was bare when the Arabs finally entered it in 820 A.D. Since the room lacked the rich inventory of grave goods typical of the few unplundered royal tombs that have been found, it is generally assumed that it was looted long ago. The absence of a mummy underlines that conclusion. Also suspiciously missing are the painted walls and hieroglyphic inscriptions usually accompanying a king's burial site. And where is the heavy lid of the sarcophagus. This would have been too massive for a few grave robbers to lug down the Grand Gallery and Ascending Passage to the narrow well-shaft and thence up the Descending Passage to the outside. Besides, what would it have been worth?

The "looting" theory has discouraged further searching for any hidden chamber containing the mummy of a pharaoh. Is the barren King's Chamber then still



The King's Chamber is a major focal point for the Great Pyramid's many mysteries. Virtually every feature raises questions that are still unanswered. For all its massive structure, the King's Chamber shows signs of powerful physical disruption, although the rest of the pyramid seems untouched!

another decoy intended to dispel any thoughts about there being a still-unlooted hidden chamber somewhere in the bowels of the Great Pyramid? If so, the great investment of time and labor expended in the construction of the King's Chamber has been so far very successful!

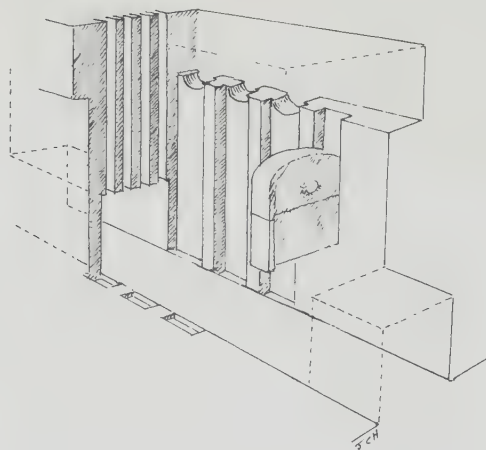
Many other mysteries begin at the King's Chamber. We have space to describe just a few. Actually, the roster commences before the chamber proper is entered.

The big step. As at the Queen's Chamber, an inexplicable step---3-feet high this time---impedes access to the King's Chamber. Here, though, the step is up rather than down. It is located at the top of the Grand Gallery. (R1)

The strange antechamber. Just beyond the big step, a horizontal passageway conducts visitors toward the King's Chamber. It is only 41 inches high, and one must stoop awkwardly until the ceiling rises abruptly to 12 feet at a place now

called the "antechamber." Considering the superb workmanship in the King's Chamber just beyond this antechamber, it is surprising to find this section rather crudely done---like the floor of the Queen's Chamber and the subterranean chamber. There are other mysteries at hand in this peculiar room. G. Hancock pinpointed them nicely.

The east and west walls of the Antechamber were composed of red granite, into which were cut four opposing pairs of wide parallel slots, assumed by Egyptologists to have held thick portcullis slabs. Three of these pairs of slots extended all the way to the floor, and were empty. The fourth (the northernmost) had been cut down only as far as the roof level of the entry passage (that is, 3 feet, 6 inches, above floor level) and still containing a hulking sheet of granite, perhaps 9 inches thick and six feet high. There was a horizontal space of only 21 inches between this suspended stone portcullis and the northern end of the entry passage from which I had just emerged. There was also a gap of a little over 4 feet deep between the top of the portcullis and the ceiling. Whatever function it was designed to serve it was hard to agree with the Egyptologists that this



The antechamber of the King's Chamber. If the three empty slots were intended to hold portcullis slabs, said slabs have never been found. (R1)

peculiar structure could have been intended to deny access to tomb robbers. (R9)

The three missing portcullis slabs have never been located---assuming they really existed. Being heavy slabs of valueless stone, it is doubtful that grave robbers would have carried them off, even if they could have budged them. And what about the granite slab that is poised in its slots? It cannot be considered a barrier, because its slots do not reach down to the floor of the passage.

The superfluous "relieving chambers". Upon entering the King's Chamber proper, the empty sarcophagus is obvious (MSP6-X2), and a quick scan of the walls reveals the tiny, controversial "air shafts" to be discussed in X7. Two of the chamber's other mysteries are concealed by the thick granite ceiling.

In 1765, N. Davison spotted a 2-foot-wide aperture at the very top of the Grand Gallery leading up to the King's Chamber. Risking his life on seven rickety ladders, he crawled into the narrow opening. Plowing through a 16-inch layer of bat dung for 25 feet, he reached a cramped chamber with a rough floor and a smooth ceiling so low that he could not stand. Now known as Davison's Chamber, the rough floor is actually the top surface of the roof slabs of the ceiling of the King's Chamber below.

Apparently, Davison did not discover this chamber named for him. Long ago someone else had laboriously cut that narrow, almost impassable, passageway from the top of the Grand Gallery into the low-ceilinged chamber. The purpose of the passage, like so much else at the Great Pyramid, is only to be guessed at.

Over a century later, R.W. Howard-Vyse wondered if still other chambers were concealed above Davison's Chamber. The granite slabs forming the ceiling of Davison's Chamber proved too hard to cut with his steel chisels. (How did the ancient Egyptians manage with only copper tools?) Howard-Vyse therefore had his men blast their way through with gunpowder. In this forceful way, the complete and very strange system of so-called "relieving chambers" was revealed to modern archeologists. (R1)

I.E.S. Edwards provided a concise description of this remarkable series of

granite slabs.

The roof of the King's Chamber has no exact architectural parallel. Above its flat ceiling, which is composed of nine slabs weighing in aggregate about 400 tons, there are five separate compartments, the ceilings of the first four being flat and the fifth having a pointed roof. The purpose of this construction, it appears, was to eliminate any risk of the ceiling of the [King's] chamber collapsing under the weight of the superincumbent masonry. Whether such extreme precautions were required by the character of the building may be debatable; they have, however, been justified by subsequent events. Every one of the massive slabs of granite in the ceiling of the chamber and many of those in the relieving compartments have been cracked---presumably by an earthquake---but none has yet collapsed. (R2)

Today's structural engineers are confident that the relieving chambers are superfluous; that is, they are not needed to prevent the King's Chamber from collapsing due to the pressure of the stone blocks in the upper reaches of the Great Pyramid. Earthquakes are another matter, however. Before assessing the seismic threat, though, we must mention the strange black dust that accumulated in one of the relieving chambers.

The black dust. The relieving chamber immediately above Davison's Chamber contained a puzzle unrelated to architectural stresses. C. Dunn has expounded on it as follows.

The chamber held a mystery for the early explorers who entered its confines, a mystery that has baffled people for decades. The chamber was coated with a layer of black dust, which, upon analysis, turned out to be exuviae, or the cast-off shells and skins of insects. There were no living insects found in the Great Pyramid, which made this discovery even more mysterious. What prompted hordes of insects to single out this one sealed chamber and shed their skins? It is a mystery that has never been satisfactorily explained. (R10)

This black dust may not be a trivial

mystery at all. More black dust has been located recently by a small robot exploring one of the "air-shafts" leading out of the Queen's Chamber. (R7)

Of course, the two deposits of black dust may be unrelated and even be composed of different substances. It is conceivable that insect eggs were deposited in the chamber unnoticed before it was sealed. They could have hatched and produced an imprisoned swarm of insects that succumbed there. The black dust could have a mundane explanation.

Evidence of a powerful seismic event. When W.M.F. Petrie meticulously measured the King's Chamber in the late Nineteenth Century, his data convinced him that the entire chamber had been violently disturbed. Every beam had been torn loose from its southern support and cracked as well. Petrie estimated that the whole chamber had expanded about an inch.

The prevailing view, as expressed above by Edwards, is that an earthquake had shaken the Great Pyramid violently at some time in the past. (R2) Some have surmised that this event occurred while pyramid construction was still underway or shortly after completion. The builders, anxious to assess possible damage may have entered the pyramid via the wellshaft and, in order to check the ceiling beams of the King's Chamber, chopped out the passage that Davison spied at the terminus of the Grand Gallery.

The earthquake theory, however, is undercut by the absence of damage elsewhere in the Great Pyramid. None of the passages or other chambers display any signs of a seismic catastrophe. As a matter of fact, remarkable precision survives in the Descending Passage. It is straight to within 0.20 inch for a distance of 150 feet and to within 0.25 inch over its entire length of 350 feet. Surely a massive earthquake would have destroyed this remarkable alignment. (R10)

C. Dunn theorizes that the damage so obvious in the King's Chamber was caused by the great pressures generated when the Great Pyramid was a power generator! (R10) His explanation and power-plant hypothesis have been categorically rejected by the scientific community. It is well known that the ancient Egyptians did not even use iron or the

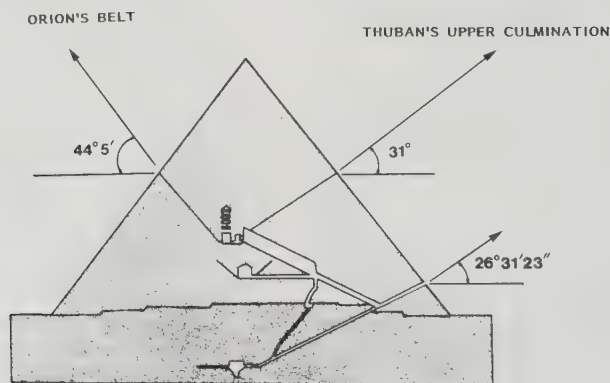
wheel. That they had some kind of advanced energy generator is simply inconceivable.

X7. The "air-shafts". The King's Chamber and Queen's Chamber are each equipped with two long, narrow shafts that disappear into the body of the Great Pyramid. The routes they take are uncertain, but it is believed that they are mostly straight and slant upward at various angles toward the outer faces of the pyramid. Of course, the workers inside the pyramid 4,500 years ago required fresh air, but the claim that these four shafts were designed expressly for that purpose is debatable. In fact, the shafts exiting the Queen's Chamber never carried a whiff of fresh air to the laborers inside because the apertures in the chamber were never completed and the external ports, if they exist, have never been located. The small cross sections of the shafts---less than 10 inches square---have precluded thorough examinations of them. No one truly knows what routes they

really take through the pyramid proper or what they might lead to. The recent use of a small robot vehicle has, as discussed below, demonstrated that at least one of the shafts exiting the Queen's Chamber had nothing to do with ventilation.

Air-shafts of the King's Chamber. The shaft apertures in the King's Chamber are positioned about 3 feet above the floor in the north and south walls. About 9 inches square (R8), it is thought that they lead directly to openings in the pyramid's exterior. Our knowledge, however, is limited to just a few feet at the ends of each shaft. From this limited view, we realize that the shafts are not straight and may have astronomical or mystical significance rather than the practical purpose of conveying fresh air to this chamber deep inside the Great Pyramid, as explained below by E. Hadingham.

These shafts slope upwards toward the outside of the pyramid, but they could not have been observation tubes, there is a horizontal bend so that a direct sighting to the sky is impos-



The two so-called "air shafts" of the King's Chamber are astronomically aligned as shown. These alignments, as verified in the Pyramid Texts, imply that the Great Pyramid was indeed a tomb. One shaft points to the star Thuban and the realm of circumpolar, imperishable stars, the other to the belt of Orion, which was associated with the god Osiris. (Adapted from MSA1-R10)

sible. Nevertheless, the main angle of each shaft does coincide with the north-south passage of two important stars at the time of the pyramid's construction---Thuban, the star then closest to the North Pole, and Alnilan, a star in Orion's Belt. We know that the Egyptians identified Orion with Osiris, the underworld god of vegetation and rebirth. Temple inscriptions speak of the pharaoh's ascension to join Osiris in the sky, where he was to command the eternal revolutions of the stars. If this explanation is correct, then the two shafts were not intended for practical skywatching or ventilation, but for the passage of the pharaoh's soul on its journey toward the afterlife in the heavens. (R4)

Undermining the astronomical/mystical interpretation of the air-shafts is an event that transpired when the shafts were cleaned out in the Nineteenth Century by R.W. Howard-Vyse. As soon as the debris had been removed, a current of cool air rushed into the King's Chamber. Since then, the chamber has stayed at a comfortable 68°F year round. The ventilation theory may be correct after all---at least for the King's Chamber. (R1)

It seems obvious from the standpoint of air flow that these shafts in the King's Chamber do provide a clear channel to the outside of the pyramid, but mysteries may still be concealed between the ends that we can examine directly. That the so-called air-shafts may be more complex can be seen in one of those serving the Queen's Chamber.

Air-shafts of the Queen's Chamber. The existence of the air-shafts of the Queen's Chamber was unrecognized until 1872, when W. Dixon, an engineer, had a hunch that, like the King's Chamber, the Queen's Chamber might also have a pair of air-shafts. No apertures were apparent in the chamber walls or anywhere on the outer surface of the Great Pyramid. Perceiving a crack in the south wall, Dixon had a worker explore the area with a chisel. Penetrating into the soft limestone, a horizontal channel 8 x 9 inches in cross section was soon revealed. The newly discovered "air-shaft" continued horizontally for 7 feet and then angled upward. A similar shaft was subsequently opened on the north

wall of the chamber. Neither shaft had been completed, each stopped about 5 inches from the inside surfaces of the limestone blocks. Perhaps this shortfall was intended. We can only speculate.

Adherents of the abandonment theory assure us that the uncompleted air-shafts that terminate just a few inches from the Queen's Chamber prove that work on the room was aborted in favor of the King's Chamber. However, it does seem strange that the builders would install two stone blocks with blind holes, which imply that a decision had already been made to abandon the Queen's Chamber, and still go on to complete work on the chamber, which except for its rough floor, is of the highest quality.

Concealment of the apertures of the shafts may have been deliberate, but concealment of what and from whom? It turns out that there is at least one "what."

One thing that was hidden and not found for 4,500 years is a stone door located over 200 feet up the southern shaft of the Queen's Chamber. In March, 1993, R. Gantenbrink remotely guided a small, mobile robot named Upnaut up the southern shaft. The first surprise was a change in the character of the shaft itself. Suddenly, the common limestone of the passage's walls was replaced by the smoothly finished Tura limestone that was usually reserved for sacred areas. Then, after crawling a total of 213 feet, the progress of Upnaut was blocked by a limestone door or plug equipped with two copper pins or handles. A small patch of black dust also lay in one corner of the obstructing door, suggesting the existence of organic matter on the other side. (R8)

To date, this exciting discovery has not been followed up, nor has the other shaft in the northern wall been investigated by Upnaut or its robotic successors. It is now apparent to everyone that the secrets of the Great Pyramid have not all been discovered. P. James and N. Thorpe have speculated on this matter.

Upnaut's first foray into the shaft has already established an important principle. It seems very likely that behind the little door there lies another, completely unknown chamber, even though it may be very small. And if there is one hidden chamber,

perhaps there are others. Is it possible that the King's Chamber is, after all, merely a bluff to throw us off the scent and that Cheops [Khufu] is buried somewhere else, even behind the tiny door with copper handles? (R11)

X8. Searching for hidden chambers. The long-held suspicion that hidden chambers reside somewhere in or under the Great Pyramid has stimulated many searches---some primitive in nature, others very sophisticated technically. Most searches have been limited to simple tapping and listening for hollow sounds or the outright excavation of suspicious areas, such as behind the curious niche in the Queen's Chamber. Of course, the well-shaft, Davison's Chamber, and the "airshafts" of the Queen's Chamber were found with just such crude techniques.

Where might further searches begin? Certainly, the primary target should be behind the door in the shaft of the Queen's Chamber located by Upnaut. One might also dig deeper through the rubble in the subterranean chamber.

Ideally, though, one would like to conduct a more comprehensive exploration of the Great Pyramid's great rocky bulk---a sort of X-ray of the entire edifice.

The use of electromagnetic waves met with failure because of the presence of moisture in the limestone core blocks. (MSP6-X3) Another "sort of X-ray" of the Great Pyramid was attempted in the late 1960s by L. Alvarez. Instead of X-rays, which would have been impractical, Alvarez and his team relied upon the natural flux of highly penetrating cosmic rays constantly raining down upon the earth's surface. Actually, Alvarez chose Khafre's Pyramid instead of the Great Pyramid itself for testing the cosmic-ray idea, because the central location of the vault in that pyramid made for simpler analysis of the cosmic-ray data. Alvarez reasoned that Khafre, Khufu's son, would have followed his father's pyramid-construction philosophy; that is, if Khufu had caused hidden chambers to be built in his pyramid (the Great Pyramid), Khafre would have done the same in his own pyramid. Perhaps so! In any case, the cosmic-ray data taken inside Khafre's pyramid were mysterious-

ly garbled. (R1) The experiment revealed nothing new.

In 1986, a survey with a microgravimeter detected "density anomalies" in the Great Pyramid's structure. The reality and nature of these anomalies were revealed when holes were drilled in one of the walls of the low-ceilinged passage leading to the Queen's Chamber. After the drill had penetrated over 6 feet into the solid limestone, it ran into a pocket of sand---not ordinary sand from the deserts nearby, but sand from another part of Egypt. Even stranger, the sand had been carefully sifted and enriched with extraneous minerals. (R5, R6) This was a bizarre finding, and the significance of the sand, if any, is beyond our ken.

Next, in 1987, Japanese archeologists discovered a previously unknown underground passageway beginning about 140 feet from the Great Pyramid and apparently extending under it. (R6) We have no further information on this development.

Reviewing these modern discoveries---Upnaut's door, sand-filled cavities, new subterranean passageways---it is difficult to escape the feeling that that immense pile of limestone blocks called the Great Pyramid still withholds secrets from us.

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- R4. Hadingham, Evan; Early Man and the Cosmos, New York, 1984, p. 22. (X7)
- R5. Bartholet, Jeffrey; "Thwarted Search for a Pharaoh," Washington Post, September 9, 1986. Cr. L. Farish. (X8)
- R6. Fouad, Ashraf; "Cavities Puzzle Pyramid Probers," Vancouver Sun, March 7, 1987. Cr. L. Farish. (X8)
- R7. Maugh, Thomas; "Robot Unveils Clue

- That May Unlock Mystery of a Pyramid," Wellington Evening Post, May 1, 1993. Cr. P. Hassall. (X6)
- R8. Bauval, Robert, and Gilbert, Adrian; The Orion Mystery, New York, 1994, pp. 41+, 93, 168, 174. (X3, X7)
- R9. Hancock, Graham; Fingerprints of the Gods, New York, 1995, pp. 284, 299, 318+, 328+. (X4, X6)
- R10. Dunn, Christopher; The Giza Powerplant, Santa Fe, 1998, pp. 15 31+, 50, 83+, 193+, 198. (X3, X4-X6)
- R11. James, Peter, and Thorpe, Nick; Ancient Mysteries, New York, 1999, p. 211. (X7)

MSP8

The Great Pyramid as an Information Repository

Description. A review and evaluation of claims that the dimensions and geometry of the Great Pyramid reveal a precocious knowledge of two transcendental numbers, the dimensions of the earth, and major events in the past and future of humankind.

Data Evaluation. The Great Pyramid has been meticulously measured over and over again by scientists and laymen alike. The dimensions themselves are not in question; rather, the interpretations of them are. Five claims that specific information can be extracted from the Great Pyramid's dimensions and geometry are listed below. The data ratings are the first figures in the evaluations.

Anomaly Evaluation. From an amazing panoply of claims, we have selected five for investigation. The anomaly ratings are the second figures in the evaluations.

- Pi is incorporated in the dimensions of the Great Pyramid (X1). Evaluations: 3/2.
- The Golden Section is incorporated in the dimensions of the Great Pyramid (X1). Evaluations: 3/2.
- Twice the perimeter of the Great Pyramid equals 1 arcminute of longitude. This is equivalent to claiming that the ancient Egyptians knew the circumference of the earth (X2). Evaluations: 3/2.
- The Great Pyramid is a scale model of the Northern Hemisphere (X2). Evaluations: 3/1.
- The history of humankind, past and future, is laid out in various parts of the Great Pyramid, as measured by pyramid-inches (X4). Evaluations: 3/1.

Similar and Related Phenomena. Other pyramids that seem to incorporate pi in their dimensions (MSP1).

Entries

X0. Introduction. Few contest that the Great Pyramid is an engineering marvel, but many deny that arcane information was encoded into its dimensions by the ancient Egyptians. As anomalists, we should not automatically reject all such claims. After all, even now, 4,500 years later, we regularly deposit with ceremony time capsules for posterity to open in the distant future and thereby learn about our age. Any culture capable of designing and constructing an edifice as remarkable as the Great Pyramid might very well have also had the time-capsule idea. Rather than bury documents and artifacts for us to dig up, the pyramid builders might have chosen to encode information about things they thought important in their stone monuments.

In this vein, Great Pyramid features may model or encode mystical, numerical, geographical, and historical verities. There is really nothing surprising about this human urge. Besides the more overt time-capsule concept, modern buildings are often oriented according to the compass, and the thirteenth floors in tall skyscrapers are sometimes omitted. In addition, architects may follow---perhaps unconsciously---the aesthetic dictates of the Golden Section. In this section, we inquire whether the builders of the Great Pyramid also incorporated information in the design of this 4,500-year-old edifice.

It is important to mention here that practical problems often arise in decoding potential dimensional information. Even with laser-based measuring rods, the original dimensions of ancient structures cannot be determined with exactitude. These structures are often well worn and weathered. Earthquakes have distorted them, and the very ground they were built upon may have settled and shifted. When one sees dimensions of ancient structures stated as being more accurate than 0.01 foot, one must be suspicious. Finally, alignments, orientations, and dimensions that appear to be highly significant to us today may be fortuitous and were of no import whatsoever to the ancient architects.

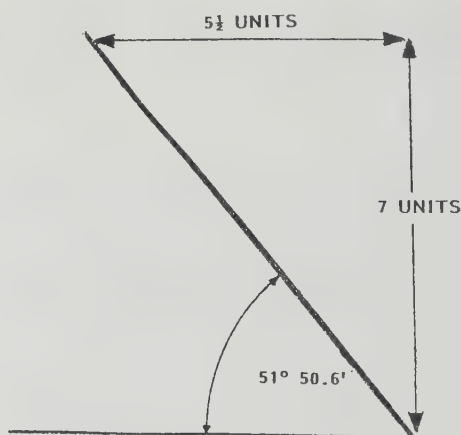
X1. Transcendental-number encodings.

Pi. Pi seems to be incorporated in the designs of several Egyptian pyramids (MSP1-X5), including the Great Pyramid. The claimed relationship states that the pyramid's perimeter is 2-pi times its height. This relationship is equivalent to saying that the tangent of a pyramid with a slope of $51^{\circ}52'$ is approximately equal to $4/\pi$. Admittedly, the Great Pyramid's slope has about this value, but does this really mean that the ancient Egyptians were familiar with pi, as a useful and pervasive transcendental number?

Perhaps not, because the slopes of the Second and Third Giza pyramids are given as $53^{\circ}4'$ and $50^{\circ}43'$, respectively. The vaunted precision of the Egyptian builders seems to be absent here, for these slopes err by almost 10%, if they were intentionally building pi into those two pyramids. (R6)

One should also add here that, with so many casing stones missing, the ragged slope of the Great Pyramid is very hard to measure accurately.

Actually, the Egyptians did not have to know about pi at all to obtain the Great Pyramid's slope in an equally rational manner. Almost the same slope is realized in a right triangle possessing



The slope of the Great Pyramid can be approximated by the right triangle shown above without invoking pi.

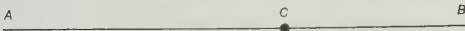
a horizontal side of $5\frac{1}{2}$ units and a vertical side measuring 7 units. The same slope may also be approximated using the major and minor segments of the Golden Section, which we mention below. (R2, R4)

Egyptian texts suggest that pi may have been recognized as an important number, although they did not appreciate its transcendental character. The value they seem to have used is 3.16 rather than 3.14169....

In the end, all we can say on this matter is that the Great Pyramid, as well as some other Egyptian pyramids, do display dimensions that seem to incorporate pi, but that it could all be coincidence.

The Golden Section. The Golden Section can be defined by dividing a line AB into segments AC and CB with point C, as shown, such that:

$$AB/AC = AC/CB = 1.618$$



One sees the Golden Section incorporated in many natural and man-made structures. Its status is similar to that of pi and e (the base of natural logarithms). In mathematics, for example, the Golden Section leads to the Fibonacci series, which is useful in describing plant structure and other biological phenomena. In human architecture and art, the appearance of the Golden Section in an object's dimensions, whether intentional or unconscious, is considered to have aesthetic value. It is obvious that this is a subjective evaluation and outside the pale of science.

It is rather easy to perceive the Golden Section in several geometrical aspects of the Great Pyramid.

In the Great Pyramid [the Golden Section] is found in the triangle formed by the height, the half base, and the apothem; that is to say, in the basic cross section of the structure. (R3)

W. Ley also points out that the ratio of the Great Pyramid's height squared to the area of one of its faces is also approximately equal to the Golden Section. (R2)

Stretching even further, G. Hancock writes that the early Egyptians inherited a system of units called "royal cubits". In these units the floor of the King's Chamber measures 20 x 10 royal cubits (34 feet, 4 inches, by 17 feet, 2 inches). The chamber's height is 11.18 royal cubits, as is the semidiagonal of the floor. Hancock asks whether it is just a coincidence that the distance CD in the diagram equals 16.18 royal cubits; that is, 10 times the Golden Section.(R7)

Surveying the foregoing "connections," one suspects that if one looks hard enough, one can find pi and the Golden Section in still other parts of the Great Pyramid.

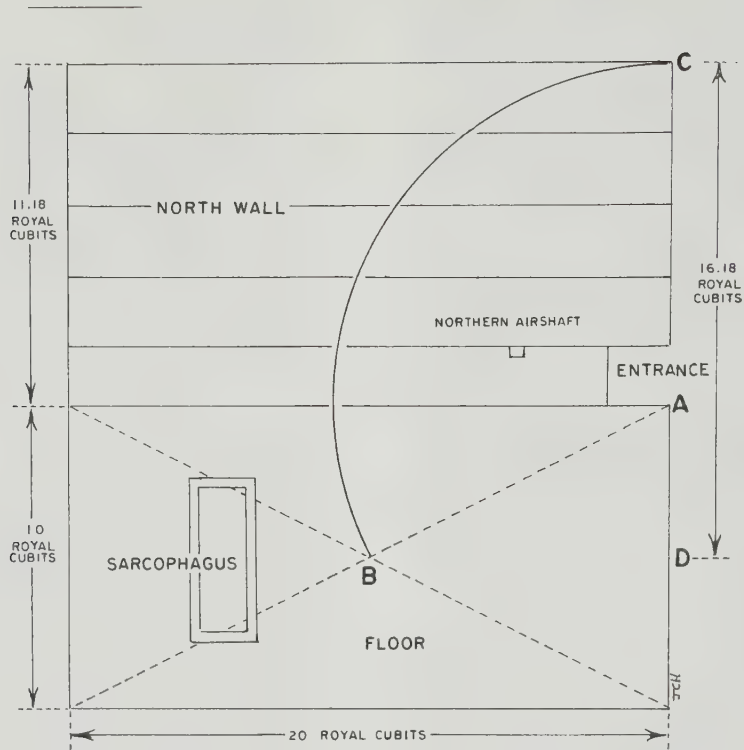
X2. Geographical models. To support the notion that a culture far older than that of the ancient Egyptians, or perhaps even extraterrestrial contacts, influenced the construction of the Great Pyramid, some speculate that the pyramid's dimensions incorporate information about the earth that the Egyptians are unlikely to have known. Here, we select two examples of this genre.

Twice the perimeter of the base of the Great Pyramid approximately equals one minute of terrestrial longitude. (R5) It is probable, but not certain, that the Egyptians did not know the circumference of the earth, and, if they did, they probably would not have divided it into our awkward 360 degrees of arc. Note, though, that it is possible to estimate the size of the earth by observing gnomon shadows at widely separated latitudes. The ancient Greeks did this, and the Egyptians might have also.

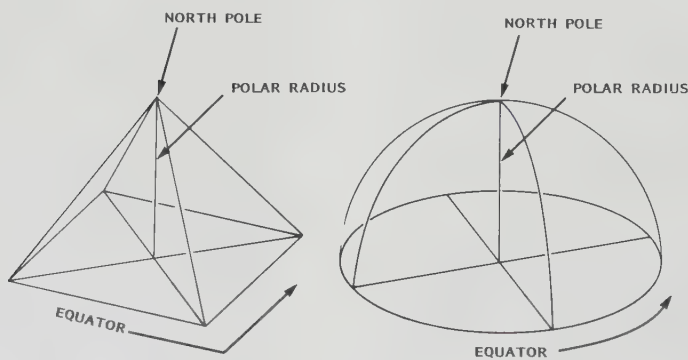
The Great Pyramid is a scale model of the earth's Northern Hemisphere. In this model, the pyramid's height represents the polar radius; its perimeter, the earth's equator, and so on, as shown in the diagram. L. Stecchini went a step further by claiming that the height of the Great Pyramid, when measured in cubits (that is, 280 cubits), represents the flattening of the earth (that is, 1/280 of the polar radius). This is really pushing the earth-model concept too far. This is apparent when we learn that the flattening is actually 1/298.3. (R4)

Such models are less than convincing when they depend upon a specific system of units; royal cubits, for example. Dimensionless ratios should really be

employed by these speculators.



If the north wall of the King's Chamber is folded back as shown. The distance CD = 10 x Golden Section when measured in royal cubits. See text. (R7)



Pyramidologists frequently argue that the proportions of the Great Pyramid are the same as those of the Northern Hemisphere, as illustrated, implying that the ancient Egyptians knew the earth's shape and dimensions. (R4)

X3. Astronomical models. The Great Pyramid definitely embodies one bit of astronomical information, specifically, the direction of the North Star. In addition, the air-shafts are widely thought to be astronomically oriented. (MSP7-X7) Still another astronomical connection, more speculative this time, is the "eclair phenomenon," which is said to mark the equinoxes and summer solstice. (MSP6-X3)

X4. Historical models. Unquestionably the most famous of all methods claiming to extract hidden information from the Great Pyramid's dimensions was developed by C.P. Smyth in the mid-1800s. In his cult classic Our Inheritance in the Great Pyramid, Smyth introduced the "pyramid-inch," which he equated to 1/25 the width of a casing stone. Why choose a casing stone as a standard of length? A reason that satisfied Smyth was his observation that the base of the Great Pyramid divided by the width of a casing stone is 365, the number of days in a year. Surely, he reasoned from this apparent relationship, the Great Pyramid must incorporate still more information of even greater importance to the human race. Smyth's key to unlocking these ancient files was the pyramid-inch. M. Gardner has summarized how Smyth employed the pyramid-inch to trace our planet's past and predict its future.

Smyth's most spectacular contribution, however, was the elaboration of a theory proposed by one Robert Menzies---that there is a great outline of history symbolized by the Pyramid's internal passageways. When these passages are properly measured in Pyramid inches, counting each inch as a year, and the symbolism correctly interpreted, you emerge with the principal dates in the earth's past and future. You discover, for instance, that the world was created

about 4,004 years before Christ. The Flood, the time of the Exodus, and the date the Pyramid was built are also indicated. The beginning of a sloping passage called the Grand Gallery marks the birth of Christ. Other features indicate the Lord's Atonement (after 33 inch years of life), his descent into Hell, and final Resurrection. Continuing upward along the gallery, one discovers that it terminates at a point between 1882 and 1911, depending on how the length of the Grand Gallery is measured. To Smyth this 29-year period is the great Tribulation which will precede the Second Coming of Christ. (R1)

The pyramid-inch scheme has been vigorously debunked over the years (R1, R2, R4) We mention it here only to demonstrate how far some cult archeologists will go. And we have passed by many others of this ilk without comment!

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- R1. Gardner, Martin; Fads & Fallacies in the Name of Science, New York, 1957, p. 177. (X4)
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- R3. Tompkins, Peter; Secrets of the Great Pyramid, New York, 1971, pp. 191, 195. (X1, X2))
- R4. Abell, George O., and Singer, Barry, eds.; Science and the Paranormal, New York, 1981, pp. 262, 267. (X1, X2)
- R5. Payn, Marshall; "Pyramid Update," Epigraphic Society, Occasional Publications, 18:73, 1989. (X2)
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- R7. Hancock, Graham; Fingerprints of the Gods, New York, 1995, p. 337. (X1)

MSS CITIES AND COMPLEXES

Key to Phenomena

MSS0	Introduction
MSS1	Unusual and Problematic Cities and Complexes: A Survey
MSS2	The Gungywamp Lithic Complex
MSS3	Mystery Hill: America's Stonehenge
MSS4	The Great Zimbabwe: A Unique Group of Stone Ruins in Subsaharan Africa
MSS5	Mohenjo-daro: The First Planned City
MSS6	Nan Madol: A Megalithic Venice
MSS7	Large-Scale Order of Cities and Complexes

MSS0 Introduction

The pyramids, forts, stone chambers, and other structures cataloged in this volume are frequently combined into cities and complexes, which in turn may display anomalies and curiosities interesting enough to warrant mention. Several of these are covered in sufficient detail elsewhere by virtue of the anomalous structures they enfold; e.g., the Giza complex (MSP5), Teotihuacan (MSP4), Tiahuanaco (MSB5), Chaco Canyon (MSB1).

In this chapter, we examine cities and complexes that lack dominant structures but which may be anomalous because of their unique design (Zimbabwe, Mohenjo-daro, Nan Madol), uncertain provenance (Gungywamp, Mystery Hill), and problematic existence (Norumbega, Quivira, etc.).

MSS1

Unusual and Problematic Cities and Complexes: A Survey

Description. Groups of ancient buildings that are:

- (1) Misinterpreted as to their age and origin. Examples: Norumbega and Quivira.
- (2) Legendary in the sense that they are believed by some to have existed but which have never been found. Examples: Atlantis and Lyonesse.
- (3) Extant but unexplored and/or undescribed scientifically in the literature examined so far. Example: Gran Vilaya.
- (4) Unusual in their construction or physical condition. Examples: huge underground cities (Nebraska) and burnt cities (Tennessee), respectively.

Data Evaluation. Many of our sources are suspect, being only brief notices in very old science journals and magazines and, even worse, old newspapers. There is, however, a sprinkling of recent, objective sources. The nature of each source speaks for itself. Rating: 3.

Anomaly Evaluation. The actual discovery of Atlantis or any other problematic city or sunken continent would be highly anomalous because we have been assured by authorities that all are purely fictional. Rating: 1.

Similar and Related Phenomena. The other sections of this chapter: the Gungywamp Complex (MSS2); Mystery Hill (MSS3); Mohenjo-daro (MSS4); Great Zimbabwe (MSS5); Nan Madol (MSS6). Other catalog volumes in the M-Series that cover artifacts, epigraphy, and anthropological data that bear upon the existence of Atlantis and other problematic cities and complexes. See Subject Indexes in these other volumes.

Entries

X1. North America

Massachusetts. On November 24, 1889, the city of Watertown, Massachusetts, celebrated the discovery of the long-abandoned Viking city of Norumbega on the Charles River. The discoverer of Norumbega was E.N. Horsford, who had been a professor at Harvard for 16 years and there had helped found the Lawrence Science School. Horsford championed the theory that the Norse once had a substantial presence in New England. This idea that the Vikings might have touched New England shores was not ridiculed in the Nineteenth Century as it is by today's professional archeologists. Our prevailing dictum insists that the Vikings did not penetrate much farther south than L'Anse aux Meadows in Newfoundland. In other words, Horsford was not far out of line for his time,

but he did push the envelope of belief too far. For example, he estimated that the Norse population in New England between 1000 and 1347 peaked at about 10,000 souls. This number of settlers should have left a wealth of distinctive artifacts, but few, if any, really convincing Norse objects have turned up. But this fact did not deter Horsford.

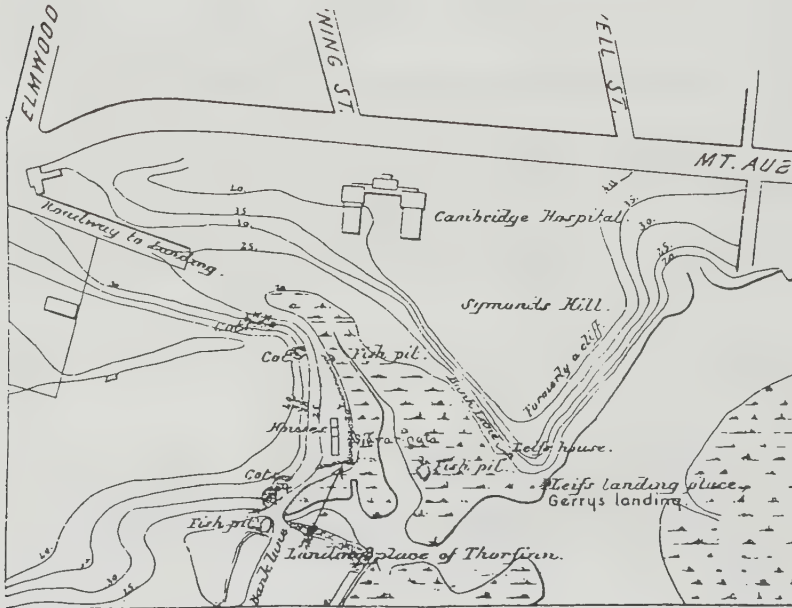
At the Watertown celebration just mentioned, Horsford made the following announcement.

It is now nearly five years since I discovered on the banks of Charles River the site of Fort Norumbega, occupied for a time by the Bretons some four hundred years ago, and many years earlier still built and occupied as the seat of extensive fisheries and a settlement by the Northmen. It is nearly five years

since the discovery was the subject of a communication which I had the honor to address to you, in your official capacity, on the first of March, 1885, and which was published in the October bulletin of the American Geographical Society of the same year.

I have to-day the honor of an-

plorers, such as Verrazano. But today, archeologists insist that this city never existed. S. Williams, a Harvard archeologist, states that there is "a total lack of evidence" supporting the existence of Norumbega. He finds no genuine Norse ruins or artifacts in the Charles River Basin. (R20)



Map of E.N. Horsford's "Norse ruins"; i.e. Norumbega, at Cambridge, Massachusetts, as reproduced in R20.

nouncing to you the discovery of Vinland, including the Landfall of Leif Erikson and the site of his houses. I have also to announce to you the discovery of the site of the ancient city of Norumbega. (R3)

Horsford asserted that Vinland stretched from Rhode Island to the St. Lawrence. Its chief city, Norumbega, was situated on the Charles River, at what is now Watertown. Everywhere, Horsford saw the remains of Norse docks, wharves, walls, dams, pavements, and forts. (Note that he never mentioned coins, tools, household items, etc.)

Interestingly enough, Norumbega can be found on the maps of some early ex-

While Williams is certain that Horsford was wildly wrong, we do catalog some New England structures that are claimed by some to be of Norse provenance. The Newport Tower, in Rhode Island, is an example. (MST1) Additionally, in our companion volume *Ancient Infrastructure*, we mention a possible Norse dam (MSC1-X1) and supposed Norse "pavements" located in New England. (MSR1-X1)

Tennessee. A 1923 issue of *Science* announced the discovery of a large Indian city on the Harpeth River in central Tennessee. This does not seem to be the typical city of the Moundbuilders, for it is very large and seems to have been destroyed by a great fire. It is

therefore of interest to quote three paragraphs from the Science report.

Charred and blackened remains of a beautiful prehistoric Indian city, destroyed by fire long before the advent of the white man, but formerly covering an area of 500 acres and defended by a palisaded wall and breastworks more than a mile in length, have been discovered in two bends of the Harpeth River near Kingstone Springs, Tennessee, by W.E. Myer, special archeologist of the Smithsonian Institution.

.....

All the buildings whose traces were uncovered appeared to have been burned. Under an overturned wall the charred remains of the woven-reed tapestry which had formerly hung on the walls of the building were discovered, and Mr. Myer and his assistants secured plaster casts of this ancient work of art for the Smithsonian Institution. No object of white man's manufacture was found on the site. Everything denoted great age.

Beyond all question this town had been lived in and destroyed long before the coming of the whites into the region, while the Indians who claimed this section of Tennessee stated to the first whites that their Indian forefathers had found these remains lying silent and deserted when they arrived. (R5)

Myer may not have been the first to come across these fire-swept Tennessee ruins. J. Jones mentions an Indian city showing signs of a great conflagration on the Harpeth River in his 1876 book: Explorations of the Aboriginal Remains of Tennessee, published by the Smithsonian Institution!

The questions of greatest interest are: Who built this city? How was it incinerated so completely? Who were the arsonists? Why did they start the fires?

Nebraska. The population figures cited below for the abandoned Indian cities seem extremely high for the location and time frame. The large, subterranean rooms are also unusual and worthy of mention, for we usually imagine Indian villages as consisting of above-ground tepees and lodges. Apparently, these

ancient Nebraska Indians were different.

In eastern Nebraska, along the banks of the Loup and Platte Rivers, excavations made last summer revealed that a great group of Indian settlements with at least a million population existed in the locality before the Pilgrims came to America. E.E. Blackman, curator of the Nebraska State Historical society, has just made extensive excavations in the region and has established that the large settlements were in existence at least as far back as 1541.

.....

Digging near Genoa, Nance County, Nebraska, on the site of a large, low Indian mound Mr. Blackman found evidences that a large settlement had once existed there. Heated underground rooms, circular in shape and as much as sixty feet in diameter were found. Under the former earth floors of these rooms were ashes, human remains, flint implements and other relics. In the same locality the remains of an Indian city of hundreds of thousands of inhabitants were discovered by means of a trench dug across an extensive Indian mound. (R6)

In Ancient Infrastructure (MSE3-X1), we catalog similar, very large, subterranean chambers that were found in the valley of the Missouri. These particular rooms were rectangular in shape and measured about 20 x 40 feet. They were judged to be about 1,000 years old. Exquisite, carved soapstone heads found in these Missouri Valley chambers had features suggesting that the inhabitants who carved them might have come from Mesoamerica. There might be a connection between the Nebraska and Missouri Valley cultures, seeing they both favored underground living quarters.

New Mexico. Northwestern New Mexico has its Chaco Canyon, replete with its mysterious roads and great buildings. While Chaco Canyon is real enough and well-investigated by archeologists, the state of New Mexico is also home to at least two fabulous cities that must be mentioned. The first has no name and may be entirely fictitious, but the second is Quivira (later Gran Quivira), which at one time had an appeal compar-

able to that of El Dorado for Spanish adventurers looking for gold.

First though, we look at the unnamed and probably imaginary city said to have been located some 90 miles northeast of Fort Stanton, New Mexico. It was described in a 1860 issue of Scientific American. It seems to have far surpassed Chaco Canyon in its grandeur. But before quoting from the descriptive item in Scientific American, it should be noted that the discovery of this remarkable city was first reported in the Fort Smith, Arkansas, Times. In 1860, Fort Smith was a small frontier settlement, where tall tales ran rampant. The following quotation is of that genre.

The plain upon which lie the massive relics of gorgeous [sic] temples and magnificent halls, slopes gradually eastward towards the river Pecos, and is very fertile, crossed by a gurgling stream of the purest water, that not only sustains a rich vegetation, but perhaps furnished with this necessary element the thousands who once inhabited this present wilderness. The city was probably built by a warlike race, as it is quadrangular, and arranged with skill to afford the highest protection against an exterior foe, many of the buildings on the outer line being pierced with loopholes, as though calculated for the use of weapons.

Several of the buildings are of vast size, and built of massive blocks of dark granite rock, which could only have been wrought to their present condition by a vast amount of labor. There are the ruins of two noble edifices, each presenting a front of 300 feet, made of ponderous blocks of stone; and dilapidated walls are even now 35 feet high. (R1)

The description continues on for some length. Suffice it to say, we have found no additional information on this wonderful discovery. Such tales circulated widely in the Old West and, as in this instance, sometimes picked up by eastern publications.

Another such putative city was Quivira. Our Encyclopedia Americana states unequivocally that the city of Quivira is only a myth. Nevertheless, in 1541, Coronado thought that the rumors had enough substance to warrant an expedition in search of Quivira. After all, it

might be a source of gold.

Coronado's men marched north through New Mexico into Kansas as far as Great Bend. There they found only Indian villages subsisting on corn and the buffalo. No gold was to be had.

So much for Quivira the myth. It seems that about 1675, the name Quivira and some of its mystique were somehow transferred to a site in eastern Socorro County, New Mexico. Now called Gran Quivira, it is now the location of a National Monument, where one can examine the ruins of an Indian pueblo and, more important to our theme, the very impressive limestone ruins of two Seventeenth Century Spanish missions. Construction of these structures began in 1659, and they are remarkable in terms of their size and stonework. The limestone walls of one of the churches are 6 feet thick and were probably 50 feet high at one time. (R11) Evidently, water supplies were inadequate to sustain the Spanish missions, and they were eventually abandoned.

It is apparent from the foregoing that there is nothing anomalous at Gran Quivira---once one is aware of the site's Spanish history. But the great limestone walls of the abandoned Spanish missions led to stories that somewhere in New Mexico there existed a great ancient city named Quivira, a city that preceded the Spanish and present-day Indian settlements and which, of course, was filled with gold. Even one professional journal promulgated this notion, as seen in this romanticized quotation from the American Antiquarian:

In the eastern part of Socorro County are the ruins of an immense city known as Quivira, covering an area two miles square. Its walls, in some places, are eight feet thick, forty feet high, and several hundred feet long. A great aqueduct conveyed water to the city, but today there is no running water within forty miles of this ancient wonder. It stands silent and alone in the sunlight and moonlight. Where once the love, industry and skill of an unknown race made thousands of beautiful and happy homes, the coyote, bat and creeping reptile hold sway. This city was in ruins at the time of the [Spanish] conquest. When and by whom it was built was a mystery to the Mexican people more than three hundred years

ago. (R4)

There is a sharp factual disconnect between the real Gran Quivira and the great ancient city described above. The massive limestone walls do exist, but Gran Quivira is no great mystery.

Obviously, one must be very careful with rumors of lost cities and cultures, even when they appear in old science journals. Atlantis's are everywhere.

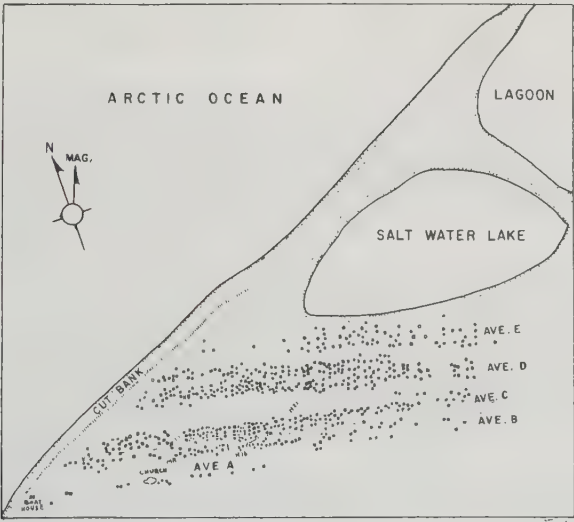
Alaska. About 150 miles north of the Arctic Circle, Point Hope juts out into the frigid Arctic Ocean. In 1940, the American Museum of Natural History dispatched an archeological expedition to this forbidding region. Led by F.G. Rainey, the team excavated an ancient town consisting of over 600 homes, all neatly laid out in rows. At its peak, this city, now called Ipiutak, probably boasted 4,000 inhabitants. This is an immense population for this icy clime. Rainey was suitably impressed.

We have now found an "Arctic metropolis," many times larger than anything previously thought possible in this part of the world and inhabited by people whose material culture differed markedly from that of the Eskimos as

we now know them. (R10)

Ipiutak's size is notable, but more important is its different "material culture." The artifacts dug up at Ipiutak included elaborate and sophisticated ivory carvings distinct from the handiwork of later Eskimos. Of particular interest is a unique and distinctive motif also employed by the Ainu of northern Japan and people along the Amur River in northeastern Asia. The Ainu were once a bold, seafaring race. Recently, their settlements have been discovered in the Kurils north of Japan, only a few hundred miles from the Aleutians and the Bering Strait. (R24) Some now speculate that the Ainu may also have gained a foothold on the North American continent long ago. Did the Ainu build Ipiutak? The ivory carvings hint at this, but we do not really know at this time.

Most significant from the anomalist's perspective is the fact that the Ainu possess Caucasian physiological characteristics. Their ancient penetration into North America could account for the several very old human fossils with Caucasian overtones that have been found on that continent over the years; for example, Kennewick Man.



The excavated ruins of Ipiutak, a large non-Eskimo city 150 miles north of the Arctic Circle. (R10)

X2. South America

Columbia. To adventurers over the past four centuries, the name El Dorado has meant either a legendary land or city of gold. Actually, "El Dorado" in Spanish means "the gilded man"---no geographical entity implied. The real translation is closer to the truth than "city of gold." In fact, there has been a succession of gilded men. All were Guatavita Indians who had been chosen by their tribe to be chiefs. The actual El Dorado story goes as follows:

Whenever a new chief of Guatavita was chosen, nobles and priests of his tribe bore him to [Lake Guatavita] on a litter hung with discs of gold, his body anointed with resinous gums and gleaming with gold dust. The chief plunged into the lake, spectators made offerings of gold and jewels, and on the conclusion of this ceremony of consecration, the new ruler and his subjects went to dance and feast in Guatavita village. (R12)

El Dorado, therefore, like many legends, has some factual basis. There is no mystery about the location of Lake Guatavita. It is about 31 miles northeast of Bogota. But there is no ancient city bearing the name El Dorado. Gold, however is found in the area around the lake and, especially at the bottom of the

lake, where rich offerings have accumulated over the years.

The Spanish did loot the Guatavita area of all the gold they could find, and upon learning of the El Dorado ceremony, they realized that they had been ignoring a possible bonanza. Consequently, the Spanish made several attempts to drain Lake Guatavita in order to retrieve the riches languishing on its muddy floor.

The first attempt to dredge the lake was in 1545, but the most serious of the early ventures was that of a merchant from Bogota, Antonio de Sepulveda, who began drainage operations in the 1580s. Using a labor force of 8,000 Indians he cut a great notch in the rim of the lake---still a notable landmark---through which the water flowed, reducing the level by 20 m (61 ft) before the cut collapsed killing many workmen. The scheme was abandoned even though gold had been found: the share sent back to Spain to King Philip II included a gold breastplate, a staff covered with gilded plaques and an emerald the size of a hen's egg. (R19)

These facts of El Dorado were somehow eventually distorted and transformed into the still-popular notion that a city of gold is still hidden somewhere in the unexplored forests of the Amazon Basin.



Old sketch of Lake Guatavita near Bogota, Columbia. Note the gap made to drain the lake circa 1580. The legend of El Dorado began here. (R19)

Explorers and adventurers have kept up the search for El Dorado. Some have never returned. No one has found El Dorado, the city that never was.

Peru. A "lost city" called Gran Vilaya has more physical substance than El Dorado. In fact, according to the city's discoverer, G. Savoy, Gran Vilaya covers an immense area of 120 square miles and includes almost 24,000 stone structures! It is located on a mountain ridge about 400 miles northeast of Lima. One would expect such a gigantic metropolis would be mentioned in all texts on South American archeology, but it isn't. Perhaps this professional neglect is the real story here.

Savoy claims that Gran Vilaya is the largest complex of ancient ruins ever found in the Americas.

He said the city's buildings ran along the ridge for at least 25 miles. He said the expedition calculated there were 10,350 stone structures in the defensive network along the ridge and 13,600 other stone buildings in three major city layouts.

The stone structures, some measuring 140 feet in length, were built atop terraces that go up the mountain slopes like stairs, he said. He described them as "complex units of circular buildings with doorways, windows and niched walls." The walls, he said, "soar up as high as a 15-story building." (R18)

The above information is from an Associated Press dispatch printed in the July 7, 1985, issue of the New York Times, but there is nary a word about these 24,000 stone structures in the professional journals we have reviewed. Savoy's discovery is backed by photos, one of which is printed in the Times article. Why are university archeologists not flocking to Gran Vilaya with their graduate students to check out Savoy's discovery? The problem seems to be that Savoy is an amateur archeologist, and his reports remain unread and/or unbelieved by the academic community. So, this particular 25-mile-long city remains "lost."

Of course, to be honest, we must also admit the possibility that Gran Vilaya in truth does not exist or has been vastly overstated.

X3. Europe. It is unreasonable to search for ancient "lost" cities in densely populated Europe. Offshore, however, the Atlantic Ocean, the North Sea, and the Mediterranean, especially, hide a multitude of sunken buildings dating from antiquity. J.D. Singer has mentioned many of these in his book Lost Lands and Cities beneath the Sea. (R21) Underwater archeologists have investigated many of these ruins now covered with marine growths and find little in them we would call anomalous.

Many of Europe's coastlines have been sinking and, over the millennia, many megalithic, Greek, and Roman structures have been submerged. Manifestly, most of these are not the "lost cities" of concern to us here. But, we do recognize two fabled cities that were supposedly swallowed up by the Atlantic and are worthy of our attention. These are Lyonesse and Atlantis.

Britain. Legend has it that Lyonesse once broke the Atlantic's waves off the southwestern tip of Britain, somewhere between Land's End and the Isles of Scilly. Part of the mystique of Lyonesse (the "land of lions"!) is that it is reputed to be the site of Camelot of Arthurian legend. It was near Lyonesse that the final great battle between Arthur and his evil half-brother Modred was engaged. A sunken city cannot be more fabled than this!

Today, when one stands on Land's End and looks out over the Atlantic, the Isles of Scilly appear some 30 miles away. Midway emerges a group of rocks called the Seven Stones. It is not unreasonable to posit that a land connection once existed between Land's End and the Scillies. Tradition has it that sometimes it is even possible, when the Atlantic is calm, to see parts of Lyonesse beneath the waves. (R19)

But anomalists like to have more solid evidence in hand than legend and rumor. The Isles of Scilly do show signs of submergence in the past. Furthermore, the encroaching Atlantic sometimes disgorges hints that it now covers a land once occupied by humans.

When there is a storm and the waves are high, the people (of the Scillies)

turn out by the hundreds to pick up the debris washed up by the waves. Bits of leaded glass, sometimes old coins, and once in a while a ring or other bits of jewelry are washed ashore from the drowned "city of the lions." In 1750, during a particularly bad storm, part of a column was found. It was three feet in diameter and was undoubtedly the base of a lost building. (R13)

Legends and the foregoing wave-tossed hints do not a lost city make, but surely there is enough evidence to warrant a few dives by intrepid archeologists.

Atlantis. The myth of Atlantis is considerably more powerful than the legend of Lyonesse and Tennyson's poignant Morte d'Arthur. Some 2,000 books have proliferated from Plato's simple (perhaps totally fictitious) description of this ancient foundered continent. We can add little here to this burgeoning bookshelf and do not propose to review the immense Atlantis literature.

As in the rest of this volume, our purpose is primarily in observations of extant structures that may be part of the foundered continent and city of Atlantis. Actually, the overwhelming mass of evidence adduced to support the long-ago existence of Atlantis is historical and anthropological in nature. Hard evidence, such as bona fide Atlantean artifacts and structures, are rare ---perhaps nonexistent. Certainly, the evidences of in-situ Atlantean structures that we have come across in the literature allow this negative interpretation.

Since Plato made Atlantis continent-size and placed it beyond the Gates of Hercules (Gibraltar), we should exclude the many sunken ruins found around the coastlines of Europe and Mediterranean isles. (Of course, we do recognize that some researchers promote the Mediterranean and even the North Sea as true locations of Atlantis.) But, we consider it more loyal to Plato's account to look in the Atlantic for a rather large underwater land mass supporting submerged structures that might be parts of a great city. We have looked through much literature and find that the pickings are scarce and of questionable quality.

The first potential Atlantis meeting our criteria is evidently located in

shallow waters because it was found by free divers. We quote from a news bulletin.

CADIZ, Spain, July 21 (UPI)---Members of a United States expedition released yesterday photographs of roads, columns and walls of an apparently ancient city under water off the coast of southwestern Spain that they believe could be the legendary lost civilization of Atlantis.

Egerton Sykes, an archeologist, told a news conference, "We can be fairly sure of the date because it is at least 6,000 years since this area was above water."

Mr. Sykes, a Briton, said there was no chance that the sunken ruins were merely Roman or Phoenician remains. These are not uncommon in the Gulf of Cadiz, where the coast has been receding for centuries.

He said that, after studying photographs and drawings made by a team of divers, he "had no doubts that what they found dated from an earlier era. (R15)

A second group of apparently sunken ruins was photographed by Russian oceanographers who were exploring the Ampere Seamount southwest of Portugal and about 450 miles west of Gibraltar. A. Aksenov, leader of the Soviet team, claimed that their photographs showed "vestiges of walls and stairways." (R17) These photos were apparently taken from a diving bell. Two years later, in 1981, the Russians had many more photographs of the putative ruins, leading to the following Associated Press bulletin.

Soviet oceanographers say they may have discovered the lost continent of Atlantis on the seabed several hundred miles west of Portugal.

Andrei Monin, director of research aboard the Soviet vessel Academician Kurchatov, said scientists based their hypothesis on "mysterious structures" seen in 460 photographs taken of Ampere Mountain, an underwater peak between Portugal and the Madeira Islands, 450 miles west of the Strait of Gibraltar.

"In a number of pictures of the northeastern part of the summit [researchers] discerned rectangular structures. On one of the photos, we can see rectangular plates [1 yard]

wide rising from the bottom," the Tass news agency quoted Mr. Monin as writing in the Soviet magazine Earth and Universe.

"The position of the plates, individual blocks, as well as the regular shape of the plates photographed ...may testify to their artificial origin," Mr. Monin said.

Describing the stonework, he said, "Its surface is divided with equal seams." He said the photographs show "a stone wall [18 inches] wide, made out of blocks." (R16)

We have seen nothing in the science literature confirming or expanding upon the Russian claims.

The regular structure the Russians photographed on the seamount bears a resemblance to the controversial submerged rock formations recently discovered near Okinawa. These, too, are claimed to be the remains of a foundered continent. (X4)

Finally, we must deal with the putative ruins of Atlantis that are located in shallow water off the coast of Bimini, one of the Bahamas. Easily accessible to skin divers, the Bimini structures are regular in shape and disposed in orderly fashion along the sea floor. However, scientists who have inspected these supposed ruins state firmly that they are merely natural beach rock with regular jointing. We classify the Bimini rock formation as a putative road in Section MSR3 in Ancient Infrastructure.

X4. Asia. The jungles of India and Southeast Asia probably conceal ancient "lost cities," but we have seen little about them that is believable and/or substantial in the literature we have so far examined. C. Berlitz, an author of several popular books, has made passing reference to two enormous jungle cities in Sri Lanka named Anuradhapura and Polannaruwa. The former is said to measure 16 miles from gate to gate and to have once sheltered over 1,000,000 people. (R14) We do not know enough to catalog these two supposed lost cities.

Cambodia's Angkor Wat and Angkor Thom are not really "lost." At their zenith in the Twelfth and Thirteenth Centuries A.D., they are not "ancient" either. While these Cambodian complexes

are very impressive, especially in their ubiquitous carvings, the buildings themselves are not sufficiently mysterious to dwell upon here.

However, the 4,500-year-old city of Mohenjo-daro, in present-day Pakistan, is both ancient and unusual, so much so that we assign a separate section to it. (MSS4)

The most problematic ancient "city" in all of Asia is probably located under the water off the Japanese island of Yonaguni in the Ryukyu chain, not far from Okinawa.

Japan. Billed as Japan's "lost city" and sometimes as "a lost continent, this strange undersea rock structure has excited the curiosity of many amateur archeologists but few, if any, professional archeologists show any interest.

Our first notice of this remarkable structure came from a 1998 issue of the London Times, which began as follows.

A structure thought to be the world's oldest building, nearly twice the age of the great pyramids of Egypt has been discovered. The rectangular stone ziggurat under the sea off the coast of Japan could be the first evidence of a previously unknown Stone Age civilization, say archeologists. (R22)

We do not know of any university archeologists who would suggest that the Yonaguni rock formation was built by an unrecognized ancient culture!

Historically, it turns out that Masaaki Kimura, a Japanese marine seismologist, learned of the Yonaguni structure in 1990. He subsequently made many dives to ascertain its character. His conclusion is seen plainly in the English title of his book on the structure: A Continent Lost in the Pacific Ocean (most of the book is in Japanese). Other divers have also been impressed with the seeming artificiality of the structure. The Yonaguni "monument," as it is also called, is hardly a city and much less a continent, for its maximum horizontal dimension is only 160 feet. Nevertheless, its configuration is very strange as natural rock formations go.

The crucial question surrounding the Yonaguni structure is whether it is truly artificial. Might it not be a natural, well-ordered geological phenomenon, like the Giant's Causeway in Ireland or that



Drawing of the "structure" or "monument" found in shallow water off the Japanese island of Yonaguni, an island in the Ryukyu chain. Most likely it is a natural formation. (From: M. Kimura; A Continent Lost in the Pacific Ocean)

infamous Bimini "road" or "wall" of jointed beach rock in the Bahamas?

In an attempt to answer this question, geologist R.M. Schoch travelled to Yonaguni, donned scuba gear, and took a professional look. He described what he saw as follows.

Superficially the monument has the appearance of a platform or part of a step pyramid, something like the ancient Temple of the Sun near Trujillo in northern Peru. The top of the monument lies sixteen feet under the surface, the bottom at an approximate depth of eighty feet. Extending over 160 feet in an east-west direction and more than sixty-five feet north to south, the asymmetrical monument has uneven stone steps, ranging in height from a foot and a half to several feet, on its southern face. It looks like a great staircase up which only a giant could stride. The surfaces have a regular smooth surface, like dressed stone. (R23)

Based upon his six dives, Schoch became convinced that the Yonaguni was, after all, only a natural rock formation. Its smooth surfaces were the result of even coatings of algae, corals, and other types of marine growth. No tool or quarry marks were in evidence on clean

stone surfaces. The horizontal "terraces" are not really horizontal, and the "steps" are not cut at 90°. Most telling, though, is the absence of joints of any kind that would indicate the handiwork of human stone masons. The entire Yonaguni structure is, in Schoch's opinion, just a single, large slab of bedrock shaped by natural jointing. Its artificiality is illusory. (R23)

X5. Africa. The most famous ancient complex in Africa, outside of Egypt and Sudan, is Great Zimbabwe, to which we devote an entire section. (MSS5) Similar ruins exist at Dhlo-Dhlo and elsewhere. These are not "lost cities" but are nevertheless unusual enough to merit mention in the same breath as Great Zimbabwe.

As for other cities and complexes in Africa, our literature research has yielded one of note.

Tanganyika. The ruins now described may be contemporary with Great Zimbabwe and also with the roads, forts, smelters, mines, and earthworks described elsewhere in this volume and in the companion volume Ancient Infra-structure.

Further particulars are now to hand of an archaeological discovery in Tanganyika reported early in July [1935]. According to a dispatch from Nairobi in The Times of August 1, Commander Nino del Grande, leader of an expedition collecting snake poison for the preparation of a snake-bite serum, camped for five days on the site of the ancient city discovered near Nguruka. He reports that the city is four and a half miles long by one and a half miles broad and is constructed terrace-wise on the wall of the Great Rift escarpment. Remains of houses, estimated to number four thousand, were found. Each had three or four rooms and stone walls four feet in thickness. Large stone tombs, one containing a skeleton, were found in the valley below. It is given as the opinion of Commander del Grande that no very high antiquity is to be assigned to these remains. It is thought that they may be about five hundred years old and the work of an advanced tribe, possibly the ancestors of the Wambulu now living some fifty miles away. (R7)

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MSS2

The Gungywamp Lithic Complex

Description. In southeastern Connecticut, a short row of standing stones, stone circles, and stone chambers intermixed with Native American and Colonial artifacts. One of the four stone chambers is equipped with an astronomically significant light shaft. Petroglyphs claimed to be similar to those common in Pre-columbian Europe have also been found.

Data Evaluation. All of the data at hand have been gathered by amateur archaeologists and reported in off-mainstream publications. While Native American and Colonial artifacts can be confirmed at Gungywamp, no undeniable Precolumbian European artifacts, such as coins and pottery, have been found. Rating: 3.

Anomaly Evaluation. The petroglyphs and a single radiocarbon date suggest an early European Christian contact. The stone chamber with the light shaft has not yielded radiocarbon dates but is similar in design to the Neolithic passage grave at Newgrange, Ireland, which also possesses a light shaft. If substantiated by future research, either of these claimed contacts would be very anomalous. Rating: 1.

Possible Explanations. Since Native American and Colonial artifacts and structures are definitely present in the Gungywamp area, it is possible that the standing stones, stone circles, and stone chambers were built by one group or the other, or both.

Similar and Related Phenomena. Stone chambers in northeastern North America (MSU1); Gungywamp chamber with light pipe (MSU1-X10); stone walls (MSW2-X1); stone rows (MSH2-X2); stone circles (MSH16-X3). The last three references are all from Ancient Infrastructure and present additional Gungywamp material.

Entries

X0. Introduction. New England is a land of many stones. For more than three centuries, farmers have been removing them from their fields. Usually, they end up in stone walls and formless heaps along the edges of pastures and hay fields. Some of these ubiquitous stones, however, are found laid out in curious rows, piled in neat cairns and circles, and in the dry-walls of those hundreds of controversial stone chambers sprinkled around New England and New York State. (MSU1)

Sometimes, several of these lithic elements are concentrated in a small area, providing us with a "complex." For example, the aggregation of cairns near Cornwall, New York is a complex. (MSM3-X3 in Ancient Infrastructure) The enigmatic Ramapo walls and associated cairns, also in New York, can also be designated as a complex. (MSW2-X1 in Ancient Infrastructure)

In this section we describe an un-

usual grouping of various stone structures located at a spot in southeastern Connecticut called the Gungywamp Complex. At Gungywamp, there are faint hints of a Precolumbian European influence that must be recorded in this catalog of archeological anomalies.

X1. General observations. "Gungywamp" is said to mean "place of ledges," and, indeed, the Gungywamp range of hills near North Groton, Connecticut, is well-ledge. On Gungywamp Hill, just east of the Thames River, are two areas displaying unusual lithic structures. The North Gungywamp area is just 0.3 mile above what has been formally designated as the Gungywamp Complex. Both deserve our attention because the stone structures in both areas hint that they were not simply piled up helter-skelter

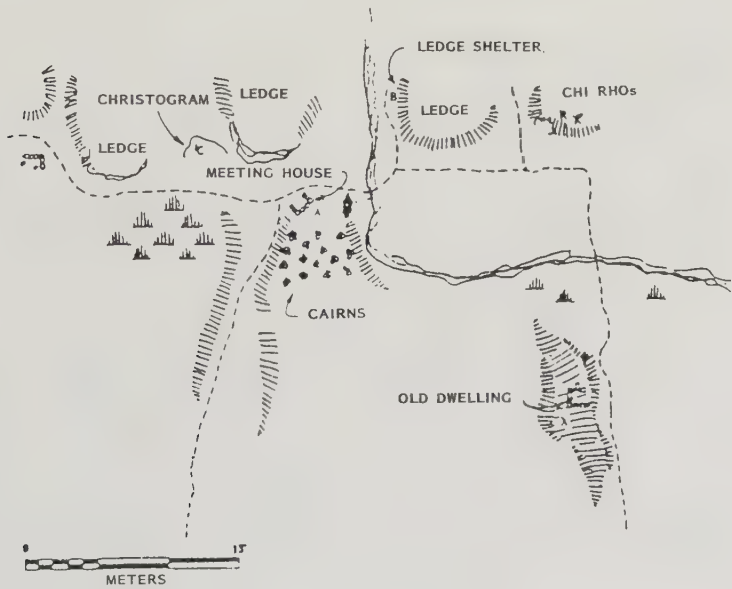
by field-clearing Connecticut farmers. (Actually, Gungywamp Hill is so heavily wooded and so far from reliable water that farmers probably avoided it anyway.) The many Gungywamp lithic structures, then, may have been emplaced and used: (1) by Native Americans for shelter and rituals; (2) by Colonial settlers as home-steads; or (3) just perhaps, by Precolumbian Europeans for rituals and for temporary residence. In any case, Gungywamp Hill must be examined.

North Gungywamp was definitely used by Native Americans, probably over a period of many years. This is indicated by the many Indian artifacts found in this area. For example, at the Ledge Shelter (see map). which is a natural cave under a high rock outcropping, archeologists have uncovered five types of Native American pottery, several dozen projectile points, scrapers, drills, a hammerstone, and fragments of soap-stone pipes. The Ledge Shelter and probably the ruins of the Meeting House (also on the map) may have been the foci of Indian rituals of some sort. (R5)

North Gungywamp is also the site of at least two ruined Colonial structures. An abundance of Colonial artifacts has been found there. So far, nothing remotely anomalous.

Why bother with North Gungywamp at all if there is nothing anomalous there? "Petroglyphs" is the answer. These include a Christogram and several "chi rhos," all resembling symbols popular in Europe in the 500-700 A.D. time frame. These rock carvings certainly suggest a presence of early Christian visitors from across the Atlantic. But, of course, they could also have been carved much later. They cannot be accurately dated and are therefore not defining evidence of an early European contact---unusual though they may be.

A couple football fields to the south of North Gungywamp is the Gungywamp Complex proper, and here are found several more substantial puzzles. The roster includes three small stone bridges, each marked by a single standing stone, and a hodge-podge of rude stone walls. There are also two rows of small stan-



Map of North Gungywamp, showing several groups of petroglyphs and numerous cairns. (Adapted from R5)

ding stones that were obviously never intended to be practical walls. These stone rows seem purposeless to us today. They enclose nothing are are worthless as barriers. In addition, one discovers stone circles and no fewer than four of those controversial stone chambers found in the hundreds elsewhere in New England. This is a true lithic complex. But what does it mean to archeologists and anomalists?

The bridges and true walls might have been products of Native American labor, although none of their artifacts has been found in this Complex area. The walls, even though apparently laid out in an aimless configuration, might be of Colonial origin. (It is not rare to come across abandoned stone walls and the foundations of old dwellings during rambles through second-growth woods in New England.) We can only assert that these stone walls and bridges of the Gungywamp Complex are ambiguous and, like the petroglyphs at North Gungywamp, are simply suggestive.

The row of low standing stones and the stone circles, however, are different matters. Both suggest more strongly, but do not prove, an ancient European influence. The stone row seems to have

no practical value and may, like its European analogs, have been used in rituals of some sort. The two concentric circles of well-worn stones, called the Tan Bark Mill on the map, may have been used for crushing bark to produce tannic acid for curing leather. This could, of course, be a Colonial construction. Radiocarbon dating of the Tan Bark Mill, though, yielded a date of 455 ± 175 A.D. Similar crushing mills were in use in Europe in this time period. (R5) If the radiocarbon date is correct, an early European presence would certainly be indicated. However, it would be useful to have independent corroboration of the date by professional archeologists.

The strongest evidence of an early European involvement at the Gungywamp Complex is seen in one of the four stone chambers. Chamber I possesses a deliberately constructed "light shaft" or "illuminare shaft" that admits sunlight to the chamber's interior only on the equinoxes. This feature can hardly be ascribed to Native Americans or early Colonials. Chamber I is so important that we describe it in more detail in MSU1-X10 along with other enigmatic stone chambers. The European connection is rather persuasive here. For example,



Map of the southern portion of the Gungywamp Complex. Chamber 1 incorporates a remarkable light pipe. (Adapted from R5)

we see an analogous light shaft built into Ireland's Neolithic passage grave at Newgrange. (MSU2-X2)

This connection would be more convincing if it were not for the fact that Newgrange is dated several millennia earlier than the nearby Tan Bark Mill at Gungywamp North.

At the Gungywamp Complex, an even more frustrating observation is a non-observation. There is a complete lack of pre-Colonial artifacts. The same deficiency also undermines the claims of ancient European involvement in the construction of most of those hundreds of other stone chambers in New England. (MSU1) Furthermore, the demonstrated presence of abundant Native American and Colonial artifacts on Gungywamp Hill overrides the architectural similarities between Gungywamp and Precolumbian Europe. A few old European "calling cards" are essential to verifying those controversial claims of Celtic and even pre-Celtic visits to the New World.

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MSS3

Mystery Hill: America's Stonehenge

Description. In southeastern New Hampshire, an enigmatic complex of stone chambers, stone passageways, standing stones, a stone circle, a stone "sacificial table," all supported by radiocarbon dates as old as 3475 BP and inscribed tablets suggestive of New World contacts by Europeans prior to the Christian Era.

Data Evaluation. Our data sources divide neatly into two groups: (1) reports based upon site studies by professional archeologists; and (2) reports in the so-called "fringe" literature that depend upon the researches of amateur archeologists. Neither side fully accepts the data of the other; and the conclusions are widely divergent. The reports of both sides seem to depend heavily upon convictions as to what each side would like the history of North America to be! There is a profound disconnect here. Rating: 3.

Anomaly Evaluation. At Mystery Hill, five narrowly specific potential anomalies combine to create a major challenge to an important archeological paradigm; specifically, that the Vikings were the first Europeans to reach North American

shores. The five types of contributing anomalies are:

- Site morphology;
- Portable artifacts;
- Radiocarbon dates;
- Inscriptions; and
- Astronomical alignments.

These contributing anomalies are defined in X0 and discussed in detail in X3. Collectively, they have the potential to undermine the "Vikings first" paradigm. Rating: 1.

Possible Explanations. Mystery Hill and European site similarities are coincidental. No convincing Precolumbian European artifacts exist at Mystery Hill. The radiocarbon dates are meaningless in view of serious site disturbance and the fact that samples were collected by amateurs. The claimed inscriptions are illusions. The astronomical alignments are too inaccurate to be significant.

Similar and Related Phenomena. The Gungywamp site (MSS2); the New England stone chambers (MSU1); New World epigraphy (MGW in another Series-M volume).

Entries

X0. Introduction. We have long known this site as "Mystery Hill" and will continue to use this appellation here. Originally, this rather confusing melange of stone chambers, walls, standing stones, and difficult-to-classify structures was known as Pattee's Caves, after its early Colonial owner, J. Pattee. But there are no natural caves worth mentioning on this 24-acre hilltop site located near North Salem, New Hampshire, about 40 miles north of Boston. Its present owners prefer to call it America's Stonehenge, even though it doesn't have the real Stonehenge's inspired geometry and those huge trilithons. Today, Mystery Hill is fenced-in and operated as a pay-to-enter tourist attraction. The small entrance fee is reasonable, for a mysterious aura really does invade this jumble of lithic structures. The visitor cannot help but wonder about the purpose of this curious complex of stone structures. Who built them and why?

The site may be mysterious to amateur archeologists, but the academics discern no enigmas at Mystery Hill. They admit that its structures are rather strange but insist that they challenge none of their paradigms. This attitude prevails not because the professional archeologists have ignored Mystery Hill,

as they have Gungywamp (MSS2), rather it is because they have dug there and found only evidence of Colonial construction and usage plus, of course, the expected scattering of Native American artifacts.

Amateur archeologists, on the other hand, see much at Mystery Hill that they deem to be anomalous. New England, in fact, is rife with amateur archeologists. Many belong NEARA (New England Antiquities Research Association), an organization formed originally to preserve and study Mystery Hill. In addition to the admitted Colonial and Native American influences at the site, many of NEARA's amateur archeologists see much evidence of contacts by Precolumbian Europeans (Celts, Druids, Iberians, Irish monks, etc., but, interestingly, no Vikings). Mystery Hill, some of them claim, saw Europeans conducting rituals and watching the celestial sphere over 2,000 years ago.

The disconnect between the amateur and professional views of Mystery Hill could hardly be greater. The amateurs claim great antiquity for Mystery Hill, but the professors of archeology see nothing there that they cannot readily explain in conservative terms.

We will evaluate the potential anoma-

lies in this section employing the following five measures:

- Site morphology. Do the structures on Mystery Hill closely resemble those at European megalithic sites?
- Portable artifacts. Did Precolumbian European visitors leave behind coins, tools, or other small diagnostic objects?
- Site dates. Do radiocarbon dates suggest Precolumbian European activities at Mystery Hill?
- Epigraphy. Does Mystery Hill yield incontrovertible inscriptions attributable to Precolumbian European visitors?
- Astronomical alignments. Does the disposition of the site's standing stones and other structures suggest that they were employed to mark the equinoxes or other astronomical events after the fashion of many European megalithic sites?

Before delving into these topics, we require a brief description and even briefer history of Mystery Hill. As will be readily apparent, a controlling factor in any evaluation of potential anomalies at this site is the great amount of archeological upheaval that has taken place over the past 300 years. Many stones have been removed for building elsewhere. There has been "reconstruction" and digs by careless amateurs. Picnickers, Boy Scouts, hunters, probably escaping slaves, fugitives from the law, and probably others have used and greatly disturbed and modified Mystery Hill. Perhaps worst has been an indeterminate amount of "reconstruction" carried out according to beliefs about who built the site and what transpired there. In other words, there has been an effort to make Mystery Hill appear not only pre-colonial but pre-Viking.

cavations at the site. (R15) The rambling, seemingly aimless nature of the outlying walls is evident. The inner core of the site with its several chambers and passageways does, however, display a bit more order, while revealing little hint of any overall purpose of the jumble of structures. Mystery Hill is obviously unlike any other archeological site in New England. If a comparison is necessary, one would select Gungywamp (MSS2) as the closest in style. Neither does the layout of Mystery Hill resemble those of any of the great European megalithic complexes, such as Avebury or Carnac. In short, it is unique.

We get a better appreciation of the unusual nature of Mystery Hill from the following description by J.P. Whittall, II, one of those amateur archeologists who have defied the experts by insisting that the site is truly well-named. In other words, this New Hampshire hilltop is truly mysterious.

The site is a carefully planned complex by a determined crew of workers. Primitive quarrying methods are apparent. Large slabs, from 2 to 50 tons, have been quarried by the use of fire and water and arranged in such a manner as to puzzle the current observer. As stated by one architect, where things should be small, they are large, and where things are large, they should be small. Drains were carefully laid out on the bedrock, some carved directly into the rock, others built and capped over. Next, chambers were constructed of dry stone walling, and then capped with massive stone slabs. All the facing walls were dressed to a rough surface. In some places the walls were constructed with large standing slabs backed by quarry rubble. Many of these slabs sat in precut niches. Various large slabs have hauling and leveling notches. About the complex are several small courtyards that are interconnected by narrow passageways that ramble between the structures. Some large stones have been shaped in such a manner as to suggest a ritual significance. At the entrance of many of the chambers a small niche has been constructed. Beyond the central complex of structures, walls ramble across a ten-acre area. These walls are constructed in a manner completely

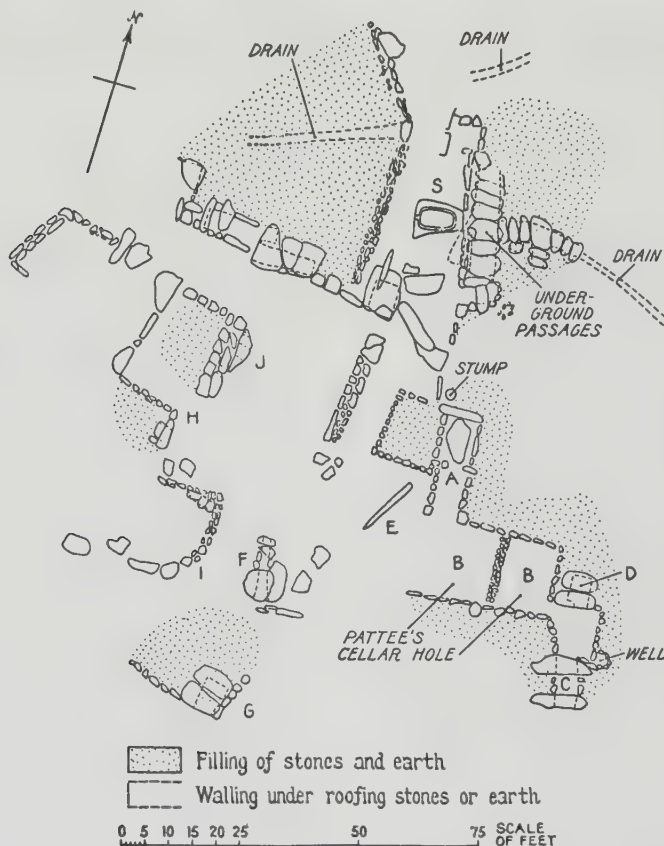
X1. A short description of Mystery Hill as it survives today. For a panoramic view of Mystery Hill, we present the frequently reproduced map made in 1955 by G.S. Vesceius, a graduate student from Yale, after his exploration and ex-

foreign to the usual New England stone fence. In fact, they are unique. Constructed of slabs and megalithic boulders, they sharply contrast with the post-Colonial repairs made in many of the walls. Also within the walls are located approximately a dozen large pointed monoliths which may have a significance beyond that of mere walling. To juggle this complexity of stonework into a logical New England farmstead pattern is impossible. (R6)

Whittall's sketch is doubtless subjective, but he sees trends and connections that seem to have escaped the few

professional archeologists that have deigned to walk the walls and inspect the various chambers.

It must be emphasized at this point that what the visitor sees today at Mystery Hill and what Whittall described above is not what occupied the site 200 years ago or even 100 years ago. Mystery Hill has been robbed of tons of stones, vandalized, disturbed by hunters and picnickers, and, even worse, is has been "reconstructed" by individuals who thought they knew the site's real purpose and rebuilt it accordingly.



Plan of Mystery Hill drawn in 1937 when it was still called Pattee's Caves. This is the way it looked before "restorations" began. S = "sacrificial table" shown to the left of what is now called the "Y-chamber." (R1)

X2. A brief history of Mystery Hill. We touch below only upon the high points in the history of this most curious example of New England's claimed megalithic past. For more details, the reader is directed to the references at the end of this section, particularly R1, R9, R10, R15, and R22.

1826. Jonathan Pattee chose Mystery Hill as the site for his farmstead. He built a home there and, presumably, some of the strange walls and other structures that puzzle us today. Some of Pattee's descendants assert that some of the stone ruins were already present on the property when Pattee acquired it. (R10) The central issues at Mystery Hill are, of course, which, if any, structures pre-date 1826 and who erected them.

1848-1933. Pattee died in 1848 and his house burned down in 1855. (R1) The references we have are mute as to what happened after that at Mystery Hill until 1933. We can imagine that this picturesque hilltop was visited many times by hunters, picnickers, hikers, and builders looking for stones during this period. Who knows how much the site was disturbed and how many stones and artifacts were removed? The only hint we have is the statement that "tons" of stones were appropriated for building a dam. (R3)

1933. William B. Goodwin purchased the property. After examining the structures still remaining, Goodwin decided that they were the remains of an Irish monastery built about 1,000 years earlier. He consequently reconstructed Mystery Hill according to this conviction. We have no record as to exactly what he did and did not do. (R10)

1945. Junius Bird, from the American Museum of Natural History, conducted what can be labelled the first scientific reconnaissance of Mystery Hill. However, his five-day-long exploration provided no clues as to possible pre-Pattee structures and smaller artifacts. Bird did, however, recommend further study. (R26)

1955. Under the direction of J. Bird, Gary Vescelius, a Yale graduate student at this time, carried out the only known, detailed, professional excavations at Mystery Hill. He concluded that Pattee

had been the major architect of what he observed in 1955. He stated further:

The collections from the various buildings at North Salem are so homogeneous, and the structures themselves have so many features in common, that it is difficult to believe that they do not all date from roughly the same time. As to the period in which they were built there can, I think, be little doubt; in my opinion they clearly date from the very late eighteenth and the early nineteenth century. They were not built by Irish monks. Rather we must conclude, as did Hencken [R1], that "at least part of the buildings was the work of Jonathan Pattee between 1826 and 1848, though there seems to have been a slightly older nucleus." (R15)

Thus was established the first, in-depth professional evaluation of Mystery Hill. It states, in essence, that there is no mystery! This assessment endures and is defended today by the scientific community.

1957. Pattee's Caves, as they were called in this time period, were purchased by Robert Stone, who renamed the site Mystery Hill. Stone then opened the site to the paying public. It is now called America's Stonehenge.

1964. The New England Antiquities Research Association (NEARA) was formed to study and preserve Mystery Hill and other archeological sites in New England. Many NEARA members, as well as others from the Early Sites Research Society (ESRS) have measured and dug frequently at Mystery Hill. However, professional archeologists have disdained further research at the site, asserting that after the labors of Vescelius in 1955, no additional attention is justified. (R10, R22, R30)

NEARA and ESRS members reject the conclusions of Vescelius. Instead, the core belief of many NEARA members is that part of Mystery Hill was built by Europeans as a ritual site in the time period 1,000-2,000 B.C.

1967. J.P. Whittall, II, discovers an inscribed tablet in a wall at Mystery Hill. The symbols seem to indicate pre-Christian era activity at the site. (R7)



G. Vescelius superimposed his plan of Mystery Hill upon a topographic map in 1955. (R15)

We consider this to be potentially one of the most important finds at Mystery Hill.

1976. Barry Fell's book *America B.C.* is published. Based upon claimed inscriptions found at Mystery Hill, Fell wrote:

The antiquity of Mystery Hill inscriptions could now be confidently set at about 800-600 B.C. (to judge by the writing style of the associated Phoenician inscriptions) and it was clear that Goidelic Celts were the occupants at that date, and in all probability the builders too. (R19)

Fell's position on Mystery Hill is rather extreme, but it has a significant following among amateur archeologists. It certainly justified the site's present name: "America's Stonehenge." One must wonder, though, why Vescelius never saw any of those inscriptions upon which Fell based his conclusions.

the structures at European megalithic sites. Others (mostly amateur archeologists) are keen to point out several resemblances.

First, the negative side of the argument. We now quote blanket rejections of ancient European influences at Mystery Hill by two establishment archeologists.

H. Hencken concluded as follows in 1939 after his survey of the ruins:

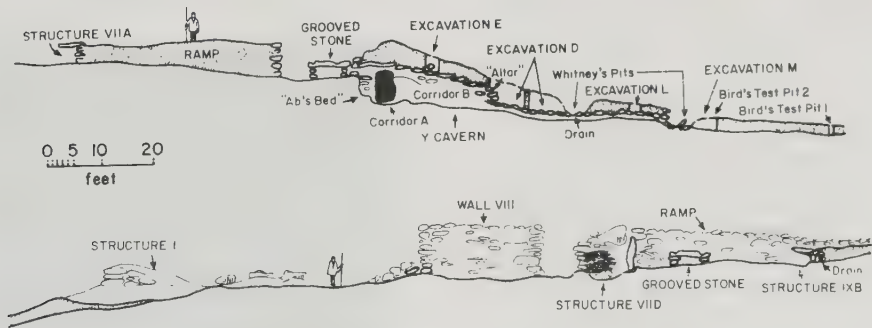
In the first place, the site no more resembles the Norse remains of the Viking Age in Scandinavia, Iceland, and Greenland than it does the early Irish monasteries. It is also most unlikely to be the work of the local Indians. It must therefore date from after the white settlement of New England in the early Seventeenth Century. (R1)

Glyn Daniel, a British authority on megalithic culture, saw only superficial resemblances.

...it (Mystery Hill) certainly bears no morphological or constructional resemblance to the great megalithic monuments of prehistoric Western Europe, apart from, of course, the coincidental resemblances that occur when dry stone is used in construction, and large stone slabs for trabeate roofing ...The real interest of Mystery Hill is not that it is a great archaeological mystery, but that it is built up as

X3. Potential anomalies at Mystery Hill.

Site morphology. Comparing morphologies in archeology, as in biology, is highly subjective. So much depends upon what one believes should be the truth. Not unexpectedly, then, some individuals (including most professional archeologists) see few if any architectural similarities between Mystery Hill and



Two of several profiles of Mystery Hill drawn by G. Vescelius during his 1955 research. (Top) An east-west section through the grooved stone; i.e., the sacrificial table. (Bottom) A north-south section through the same stone. (R15)

such. (R5)

Of course, Mystery Hill is a megalithic complex, seeing it is composed of large stones. But viewing it in plan and cross section, Mystery Hill is---in the large---quite unlike New Grange, Stonehenge, or one of the Maltese temple complexes. Its bits and pieces are scattered about rather than unified around a central structure. Instead, the claimed similarities to European megalithic sites involve specific, isolated features. Three of these are well worth mentioning.

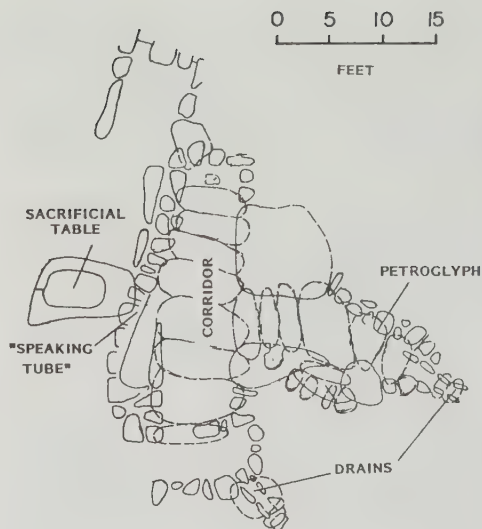
First, there is the profusion of large, recumbent, triangular monoliths. S.M. Trento reports seeing ten of these, some of which were 20 feet long, 10 feet wide, and 1 foot thick. These stones bore maul marks and other signs of artificial shaping. It is doubtful that practical New England farmers would manufacture such ponderous monoliths for their walls when small, suitably shaped stones were everywhere. (R9)

Although H. Hencken firmly rejected a European megalithic cast to Mystery Hill, he did remark upon one morphological similarity.

There is a single feature shared by Pattee's Caves and early Christian sites in Ireland. This is corbelled vaulting, which appears in very rudimentary form in the Y-Cavern. (R1)

Of course, Hencken is quick to add that corbelling was a simple, very popular form of construction in ancient times. If the principle of the arch is unknown, corbelling is an obvious way to provide a stone structure with a roof. One must not make too much of it.

Probably the most alien (non-Colonial) structure at Mystery Hill is the so-called "sacrificial stone." This 4½-ton granite slab is 10 feet long, 6 feet wide, and 1 foot thick. It now rests about waist-high on a pile of smaller stones. This is a perfect height for human sacrifices, an impression strongly fostered by a 1-inch-deep groove around the edges of the stone that is drained by a spout. Even the most skeptical archeologists cannot deny the vision that gory rituals might have once been enacted here! (R3) However, there are less-radical interpretations. The "sacrificial stone" may be only a Colonial "lye-stone," where lye was leached out of wood ashes. Or it

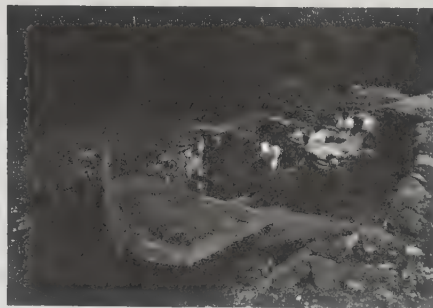


Details of the Y-chamber, showing the location of the putative "speaking tube." (Adapted from R15)

might have been part of an old cider press.

But reinforcing the ritual interpretation is a curious tube or channel built into a nearby structure. E. Hill described this as follows:

Beneath [the "sacrificial stone"], at the end opposite the crude spout, is the opening of a horizontal stone tube that leads eight feet into a triple-chambered structure called the Y-Cavern. Here the tube is head-high,



A portion of Mystery Hill as it appears today. The "sacrificial table" is shown in the foreground. (P. Ferryn, Kadath)

so that a man concealed in the Y-Cavern can speak into it, and his muddled voice will swell out beneath the sacrificial stone. When a tourist guide demonstrates, his muffled words sound weird and impressive even in the bright sunlight of New England summer. When he mentions the oracle at Delphi---where ancient Greeks heard prophecies delivered through a similar tube---the stone-cluttered hillside, already confusing and challenging, becomes even more mysterious. (R3)

J.P. Whittall, II, has pointed out that a similar grooved stone table exists in one of the ancient Maltese temples. (R6) Also pertinent is the subterranean Hypogeum---part of Malta's megalithic complex---which contains an "Oracle Room" with a hole in one wall, through which a concealed priest could speak during rituals. (MSB7) History and distance make a Malta-Mystery Hill connection very unlikely, but we mention it anyway.

This appearance at Mystery Hill of a possible sacrificial stone and speaking tube is so alien to New England Colonial life that one wonders how that claimed megalithic link can be denied. But, as usual, the skeptics have an answer: the sacrificial stone and speaking tube were built by the "eccentric" Pattee in the mid-1850s. Since these two features have not been specifically dated, who can deny this conservative possibility? One has only to point to Florida's surprisingly impressive "Coral Castle," which is undeniably megalithic and yet demonstrably the work of one modern man.

Portable artifacts. Mystery Hill must have taken many man-years to construct, regardless of who built it and when. The workers who gathered and raised the multitudinous stones, some weighing tons, must have dropped a few tools and personal items. The required infrastructure, too,---the signs of occupation, cooking, hunting, etc.---cannot have been completely obliterated. As it turns out, artifacts have been found in abundance at Mystery Hill. The great majority of them were unquestionably discarded by Native Americans and Colonials. Once again, as at so many of New England's controversial stone chambers and other structures, clear-cut, incontrovertible Precolumbian European artifacts are

nowhere to be found---at least in the opinions of the professional archeologists. By way of comparison, many genuine Viking artifacts have been located at L'Anse aux Meadows, Newfoundland, and also on North American islands farther to the north.

W.B. Goodwin, who "reconstructed" the site in the 1930s and 1940s, came across pottery fragments, stone scrapers, a slate shovel, and numerous other objects that one would expect to find at a site known to have been frequented by Indians and, later, occupied by Colonists. Goodwin was disgusted with the portable artifacts he collected, for they did not support his contention that Mystery Hill was long ago an Irish monastery. He did not catalog and label his finds. Today, they are dispersed and lost and cannot contribute to the discussion. (R3)

G.S. Vescelius, during his 1955 digs, collected even more artifacts. In fact, he found more than 7,000 of them. At his Excavation A, Level 1, alone, he uncovered 1,059 glass fragments, 803 potsherds, and 210 nails. His diligence and thoroughness are apparent in his long catalog of finds. (R15) Vescelius considered all of his vast collection of artifacts to have come from either Native American or Colonial sources, mainly the latter. Unlike Goodwin, he was not disgusted with his finds because they fit well with his conclusions about the builders of Mystery Hill.

Vescelius' catalog of portable artifacts is devoid of the stone and bronze items one would expect to find at a site built by Europeans 4,000 years ago. Even Indian arrowheads are absent. But there are bottlecaps, buttons, and flashbulb fragments, etc. in abundance. (R15) Nevertheless, some of the popular literature on Mystery Hill claims that some of the site's pottery and stone tools are virtually identical to those in use in Europe circa 2000 B.C. (R10) As a matter of fact, in 1975, 20 years after the work of Vescelius, J.P. Whittall, II, reported finding a hammerstone, a broken pick, and a hand scraper at Mystery Hill. It therefore seems possible that Vescelius may not have dug deeply enough and may have missed some important artifacts that would have changed his conclusions! (R6)

To our knowledge, Whittall's important discoveries have not been evaluated

by recognized authorities in the archeological profession.

Mystery Hill radiocarbon dates. Since the portable artifacts (discussed above) have not provided archeological establishment with the incontrovertible evidence they demand, the amateurs have enlisted radiocarbon dating in their cause. Radiocarbon dating can be very convincing if used properly under favorable conditions. Unfortunately, the conditions at Mystery Hill are far from ideal.

Charcoal is the most important type of artifact found at Mystery Hill that is suitable for radiocarbon dating. There is no shortage of this substance at the site. Vescelius cataloged many fragments. The problem is that it is difficult to tell where the fragments came from originally. The site is highly disturbed. Goodwin, in particular, moved stones and soil during his extensive "reconstruction" of the site. Two hundred years before Goodwin, Pattee had also disturbed the soil of Mystery Hill as he dug foundations for the structures he built. In addition, there has been a long parade down the centuries of campfire-building visitors. Radiocarbon dating must be done with great care at such a highly disturbed site.

Since professional archeologists trained to collect samples for dating no longer deign to visit Mystery Hill, it has been left to the amateurs to gather charcoal samples and pay out of their own pockets for laboratory analysis. Even when radiocarbon dates are produced, the professionals are leary of them because they wonder if enough care was exercised in their collection of samples. After all, amateurs are amateurs!

Despite such barriers to "official" acceptance, some impressively early radiocarbon dates from Mystery Hill have crept into the literature. We tabulate four of these.

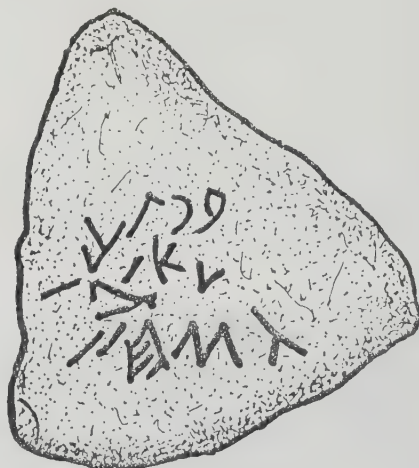
Date	Circumstance of Collection
520 AD	Under a capstone of the Oracle Chamber drain (R9)
1250 BP	Fire pit on south side of Polaris Stone (R18)
2995 BP	"Lower level of human activity; i.e. quarrying" (R6)

3475 BP "Between the crack of existing structure" (R6)

The first and second dates are consistent with Goodwin's Irish monks. The last two dates fit well with the theory of Neolithic and/or Bronze Age European contacts.

Naturally, these dates are challenged based upon the highly disturbed nature of Mystery Hill and the amateur status of the investigators. Once again we have a profound gap between amateur and professional assessments that cannot be closed here.

Epigraphy. During their intensive labors at Mystery Hill, neither Goodwin nor Vescelius recognized any inscriptions attributable to Precolumbian contacts with the New World. But in 1967, J.P. Whittall, II, was sinking a test pit in one of the site's small chambers when he came across a triangular stone slab. This stone measures 35 x 35 x 6 centimeters. It bears strange markings resembling script of some sort. (See figure.) If these markings are indeed an ancient inscription and if the triangular stone



Sketch of the inscribed stone discovered by J.P. Whittall in 1967. (R9)

cannot be rejected as a modern hoax, we might have proof that Mystery Hill is more than a Colonial aberration.

This most important discovery languished undeciphered for eight years. Then,

In 1975 the inscribed stone slab I [Whittall] recovered in the structure in 1967 was brought to the attention of Dr. Barry Fell, President of the Epigraphic Society, and an astute scholar in ancient languages. Though the markings were badly worn, he recognized them as an Iberic inscription. He suggested the following translation dating to approximately 800 B.C.

"To Bel, they, the Canaanites set it up. May he have mercy on us." (R7)

Bel was the Celtic sun god and may be equivalent to the older Baal, a Phoenician god. Thus, this purported tablet could easily be over 2,000 years old, as Fell suggests.

One could not find better confirmation of the core claim of the Mystery Hill enthusiasts; that is, Mystery Hill was visited by Europeans several centuries before Christ.

But are the markings artificial rather than natural? If they are man-made, is Fell's translation correct?

Photographs of the stone, now called the Dedication Stone, usually show the claimed symbols emphasized by chalk. However, there are other "furrows" that are not chalked and presumably natural. Are the champions of the ancient-visitors hypothesis just imagining that some of the natural furrows are artificial? It would not be the first time this has occurred in archeology. In fact, the Mystery Hill symbols bear some resemblance to those on the Chatata Wall, in Tennessee, which were once pronounced to be man-made but eventually proved to be otherwise. (See MSW5-X1 in Ancient Infrastructure.)

Inscriptions like that on the Dedication Tablet once again reveal the rift separating many amateur archeologists from the professionals. The latter categorically reject Fell's translations (R22), while the former consider them proof positive of pre-Christian contacts. A catalog such as this one can go no further than outlining both sides in these controversies.

Two other supposed Mystery Hill inscriptions are significant enough to enter here. Both were found in the summer of 1975.

In July, B. Fell, G. Carter, and R. Stone were examining the chamber in which Whittall found the Dedication Tablet. In an adjacent dry-stone wall, Stone came across still another tablet. As the dirt was brushed off, Fell saw immediately that the stone bore an inscription in ogam, an ancient alphabet. His translation was: "Bi Bel," meaning "Dedicated to Bel." (R19) A suspicious person might wonder if this new discovery was more than a coincidence. Any conscientious anomalist would!

The second find of 1975 was a fallen monolith displaying the Latin inscription "XXXVIII LA" or "Day 39" in English, according to Fell. This is not a meaningless statement. In Roman times, the 39th day of the year was the day of the Beltane festival, dedicated to Bel. Thus, for a third time Bel's name is injected into the discussion. Also pertinent is the fact that the fallen monolith "seemed" to have been part of a calendar site.

This so-called Beltane Stone has been described by C.J. Cazeau and S.D. Scott, Jr., as simply a group of natural stress cracks in the rock. Cazeau personally examined the Beltane Stone and assures us that the marks said to be superficial engravings actually extend deeply into the stone. He also points to other natural cracks that have been ignored could legitimately be considered part of an "inscription." (R10)

Cazeau and Stone also reject the 800 B.C. date for the Dedication Tablet. Ogam, they assert, did not appear in Ireland until the Fourth Century A.D., centuries after Fell's date. (R10)

If the purported Mystery Hill inscriptions are genuine and their translations accurate, this part of New England must have been a focus of pre-Christian European activity---perhaps a well-known shrine or ritual site---at which Celts and perhaps others left a few words addressed to their gods preserved in stone.

Obviously, you will not find speculations like those above in any archeology or history texts. The Mystery Hill inscriptions remain unrecognized by the scientific community for what it considers to be good reasons.

Astronomical alignments. The stones at many European Neolithic and Bronze Age sites are aligned with astronomically significant events, the equinoxes and solstices in particular. Even in the New World, some of the stone circles, some

so-called calendar sites, and the medicine wheels display these sorts of alignments. In North America, these astronomically oriented structures span the continent from New England to the southwestern states. (See MSH16, MSH21, and MSH22 in Ancient Infrastructure.)

In this wide geographical context, to find a stone circle with astronomical overtones at Mystery Hill would be no great surprise.

Our ancestors everywhere observed the night sky diligently. Equinoxes and solstices were well known to them. It was simple and reasonable to line up stone and horizon markers to chart the annual course of the sun. No diffusion from other cultures was needed. An astronomically aligned stone circle at Mystery Hill, therefore, is only very weak evidence of early European contacts.

It turns out that there is a stone circle on Mystery Hill that is claimed to be an astronomical observatory. There are five stones plus a sighting point. One stone, the North Stone, marks the meridian. The other four are aligned with the sun's position at the solstices. (R19)

Two skeptics, Cazeau and Scott, state that according to the map in their Mystery Hill Tour Guide, the four solstice stones are not placed accurately enough for the circle to be an observatory. Furthermore, they add, in any site consisting of so many stones and horizon features, it is rather easy to find significant astronomical alignments. (R10) They doubt the presence of an ancient astronomical observatory on Mystery Hill.

Incidentally, the nearby Burnt Hill stone circle is more impressive than that claimed to exist at Mystery Hill. (MSH16-X3 in Ancient Infrastructure.)

X4. Final observations. If only we could unleash a trained team of archeologists on an undisturbed Mystery Hill! Then we could perhaps close the belief gap between the amateurs and professionals. As this is impossible, we can only say at this point that Mystery Hill is a complex site that was unfortunately highly disturbed over the years. It still poses archeological problems that are not completely resolved today and may never be.

The most important evidence supporting early European contacts (say, 500-800 B.C.) are the radiocarbon dates, but these are easily challenged. The most telling point against these purported contacts is the apparently total lack of portable artifacts that such visitors should reasonably have left behind.

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MSS4

The Great Zimbabwe: A Unique Group of Stone Ruins in Subsaharan Africa

Description. The greatest of several thousand similar but less extensive stone ruins in Subsaharan Africa. Great Zimbabwe differs substantially from ancient stone structures elsewhere in the world in its overall design (or lack of design) and its unique type of dry-wall construction.

Data Evaluation. Although Nineteenth Century speculation about the origin of Great Zimbabwe was far off the mark, scientific investigations begun in 1905

have provided a solid data base. Many journal articles and a few books are available for those interested in this unusual site. This data base is compromised, however, by past depredations by looters, who severely damaged the archaeological record. Rating: 2.

Anomaly Evaluation. The only significant anomaly presented by Great Zimbabwe involves its size, unique architecture, and excellent stonework, which collectively counter the common conceptions of African culture and history. Rating: 2.

Great Zimbabwe, however, also exhibits several curiosities that require cataloging; e.g., nonrectangularity, a peculiar stone tower, and an acoustic cave. Rating: 3.

Possible Explanations. Great Zimbabwe was constructed by an energetic, highly capable, native African culture.

Similar and Related Phenomena. None. Great Zimbabwe is unique insofar as its architecture is concerned.

Entries

X0. Introduction. Zimbabwe is not only the name of a country in southern Africa but also a general term applied to stone ruins left in this region by poorly understood cultures. Usually, Africa south of the Sahara is pictured as a land where the natives have long dwelt in structures made of wood, straw, and earth---until the Europeans civilized them, that is! The fact is that the thousands of zimbabwes scattered across southern Africa strongly belie this condescending picture of Subsaharan Africa and its pre-European past. (R12) As many as 20,000 sites of stone ruins speak instead of an Africa that between 1000 and 1500 A.D. was bustling with gold mining and commerce with Egypt, Madagascar, India, and the world of Islam.

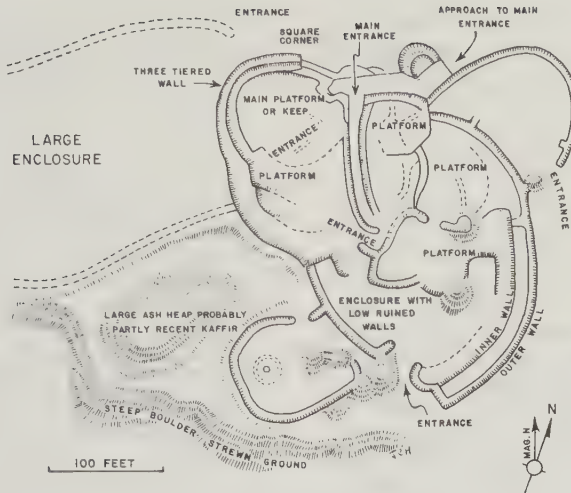
Fascinating though this neglected history of southern Africa may be, we try here to maintain our focus upon the relevant engineering structures; that is, the zimbabwes. From the great multitude of stone ruins surviving between the Zambezi and Orange rivers---an area of 270,000 square miles---we select for our example the aptly named "Great Zimbabwe." It is an easy choice, because the Great Zimbabwe includes the most impressive stone structures in Africa outside of Egypt and northern Sudan.

Great Zimbabwe is anomalous in the sense that it sharply skewers the aforementioned common perception of southern Africa before the arrival of the European settlers. In addition, these ruins are like none other outside of southern Africa; they are both strange

and unique. For example, Great Zimbabwe is curiously nonrectangular; corners and straight lines are virtually nonexistent. Great Zimbabwe is, in a word, "incoherent." Though sometimes described as a "fort," it is indefensible. Its towers and walls seem purposeless. While we cannot rate Great Zimbabwe as highly anomalous, like the Great Pyramid some 3,400 miles to the north---on almost precisely the same meridian---it projects so many curiosities that it must be recorded here.

X1. History and European attitudes. Great Zimbabwe was unquestionably well known to nearby Egypt, India, and Islam before the Europeans "discovered" it in the late 1800s. As mentioned above, what is now Zimbabwe, the country, was mined assiduously for gold and copper centuries before European explorers finally chanced upon what is left of Great Zimbabwe. The modern country of Zimbabwe, in fact, encompasses the remains of perhaps 1,200 ancient gold mines. (See MSE5-X4 in Ancient Infrastructure.) This was once a busy place! Nevertheless, most European histories of Great Zimbabwe seem to begin with its "discovery" in 1867 (some say 1868) by A. Renders, a European hunter. Renders later told a German explorer, K. Mauch, of his find and led him to the ruins on September 5, 1871---the "official" date of discovery! (R9)

Actually, Europeans had been aware



Plan of the Dhlo-dhlo ruins. This site is one of the many other ruins called "zimbabwes" scattered across the country of Zimbabwe.

of Great Zimbabwe's existence for at least 240 years before Mauch looked upon this vast collection of ruins. In 1531, V. Pegado, who was then Captain of the Portuguese Garrison at Sofala, an old port on the coast of Mozambique near today's Beira, described Great Zimbabwe thus:

Among the gold mines of the inland plains between the Limpopo and Zambezi rivers [there is a]...fortress built of stones of marvelous size, and there appears to be no mortar joining them...This edifice is surrounded by hills, upon which are others resembling it in the fashioning of stone and the absence of mortar, and one of them is a tower more than 12 fathoms high. (R15)

Pegado was right about the tower and absence of mortar, but the stones of Great Zimbabwe are hardly of great size in comparison to those of the Great Pyramid and Stonehenge. It is apparent that most of them can each be lifted by a single worker.

As European settlers filtered into southern Africa and established hegemony, they could not believe that Great Zimbabwe, the thousands of lesser zimbabwes, all the ancient forts, roads,

and aqueducts that they came across were really the work of the native Africans they encountered in this region. Instead, they maintained that these thousands of structures must have been constructed by non-Africans or at least under the direction of non-Africans. It was popular to think that the region around Great Zimbabwe was ancient Ophir, King Solomon's land of gold, and that somehow the Queen of Sheba was connected with Great Zimbabwe. This picture was obviously racist and was soon to be proven far from the truth, for Great Zimbabwe is without question 100% African in origin.

The first blow to the racist's view came in 1905 with the work of D. Randall-McIver, the first scientifically qualified person to study Great Zimbabwe. He could find no artifacts earlier than the Fourteenth and Fifteenth centuries A.D., and these were undeniably of African provenance. The white inhabitants of Zimbabwe (then Rhodesia) were incensed at Randall-McIver's findings, for they were so contrary to their preconceptions and assessments of the natives. They rejected them vehemently. But in 1929, archeologist G. Caton-Thompson confirmed Randall-McIver's research, as have all subsequent scientific studies. (R9)

Although most artifacts found at Great Zimbabwe date from the 1300s and 1400s A.D., gold mining in the region probably began as early as 100 A.D. After some three centuries, the easy-to-mine gold ran out and the area around Great Zimbabwe was abandoned. About 1000 A.D., cattle-raising people moved into the area. It was these immigrants that who began the construction of Great Zimbabwe, apparently most of the building occurred during the Eleventh and Twelfth centuries. Great Zimbabwe was then a trading center and continued to prosper until about 1500 A.D. (R9)

The history of Great Zimbabwe is a bit fuzzy because, like Mystery Hill (MSS3), it has suffered much physical disturbance over the centuries. In particular, the profit-dictated operations of the Ancient Ruins Company, Ltd., wreaked archeological havoc. This company was formed in 1895 by two South African investors who were interested only in the gold artifacts they might find among the zimbabwes. Called the "explorers of Ophir," these men and their employees not only melted down artifacts and pulled down walls but also disturbed Great Zimbabwe's stratigraphy with their shovels. (R12)

Despite all these depredations, Great

Zimbabwe remains a remarkable complex of structures. Archeologists have been able to learn much, but many mysteries, mostly of a minor sort, remain.

X2. A brief description of Great Zimbabwe.

Great Zimbabwe is situated in bush country about 250 miles inland from the Indian Ocean and 300 miles south of the Zambezi River. For a general picture of the site, we quote from a 1905 article in Knowledge, then a popular British science magazine. Bear in mind, though, that the article was written before Randall-McIver's bombshell revelation that Great Zimbabwe is not only purely African in origin but that the major structures date back only to about 1000 A.D.

The ruins of the Great Zimbabwe consist of three main sets of structures: (1) the Elliptical Temple with the conical tower; (2) the Acropolis or Hill Ruins of bewildering extent on Zimbabwe Hill; and (3) the Valley of Ruins, the latter being a conglomeration of smaller ruins of all ages occupying a large area in Zimbabwe Val-



Aerial photograph of the Great Enclosure from the east. (Zimbabwe Tourist Board)

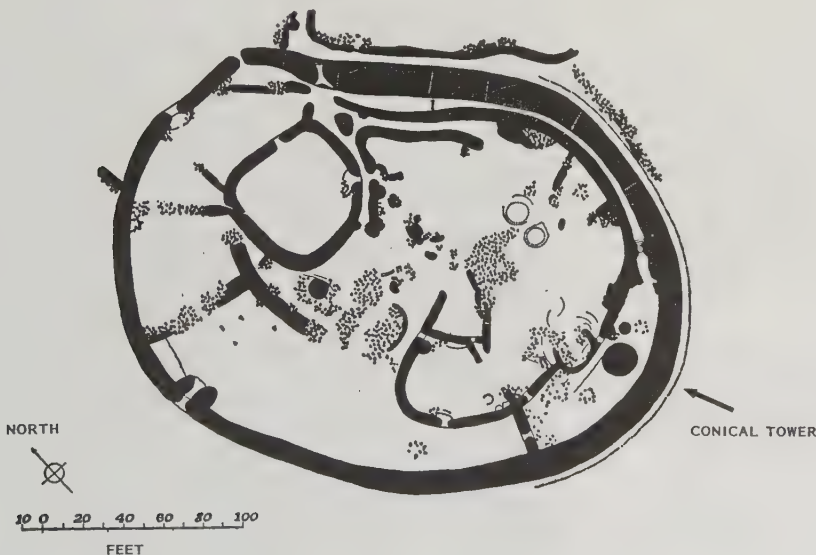
ley.

The chief archaeological interest, however, centres in the Elliptical Temple, an object arousing wonder and even sheer amazement to all who visit these ruins. Its massive and stupendous walls, gracefully sweeping curves, and most excellent workmanship and decorative mural patterns, at once rivet the attention. The plan of the building is elliptical, while the ends of the walls, sides of entrances, and buttresses are all rounded. The angular form of building is absent. The walls are very substantially built of dressed granite blocks laid without mortar or cement, and have bases averaging from 7 ft. to 16 ft. in width, and are beautifully and skillfully constructed not only on their exterior faces, but in their internal portions. The walls average a height of from 24 ft. to 31 ft., the main east wall being 16 ft. wide at its base, and at a height of 30 ft. its summit is 8 ft. in width. The leanback or batterback of the faces of the wall gives an Eastern appearance to the building, which is very striking. The summit of the main east wall was once decorated with tall granite monoliths, the bases of some twenty-six monoliths remaining in situ. The other

face of the east wall bears a pattern of chevrons in two rows worked in granite blocks. This pattern is one of the earliest decorative designs known to research and is the ancient emblem of Water and Fertility of the old Nature worshippers.

The Conical Tower, 32 ft. in height, is one of the principal architectural features of this building. Its lines are worked out with marvelous skill. It is perfectly solid, and with it is associated a high stone platform approached by steps. The tower is considered by many leading men of science to be identical in purpose, if not in general form, with the Baal towers of Arabia, Phoenicia, Canaan, and Babylon, referred to in the Holy Writ.

The interior of this immense building is divided into some fifteen enclosures, and there is no less than 700 ft. length of passages within the walls, the most famous being the Parallel Passage, which leads directly from the north or main entrance into the Sacred Enclosure in which stands the Conical Tower. Many leading European experts place the age of the Temple at some period between 1600 and 1100 B.C. (R4) [!]



Plan of the Great Enclosure (formerly called the Elliptical Temple) of the Great Zimbabwe. The Conical Tower is in the lower right.

Modern terminology has the Acropolis renamed as the Hill Fortress, and the Elliptical Temple is now called the Great Enclosure, which is encircled by the Great Wall. (R12)

Given this overall picture of Great Zimbabwe, we now ask if there is anything anomalous there or at least curious enough to comment upon.

X3. Possible anomalies and curiosities at Great Zimbabwe. Upon examination and reflection, most of the features of Great Zimbabwe that excite interest are more curious than anomalous; that is, they are "interesting" but do not undercut any archeological tenets. As a whole, however---Hill Fortress, Valley Ruins, Great Enclosure---Great Zimbabwe is anomalous in the sense that it defies so forcefully the prevalent notion that Sub-Saharan Africa was never more than a subcontinent of thatched huts and kraals. In support of this evaluation, we quote W. Mallows, an authority on Great Zimbabwe, who has delved deeply into the history and engineering of this wonderful archeological site.

The ruins of the Great Zimbabwe, lying about 300 miles south of the Zambezi and 250 miles from the Indian Ocean, form one of the most extensive, impressive, and extraordinary group of ruins anywhere in Africa, and indeed, of their kind, in the world. They have been called the greatest stone monument on the African continent, apart from Egypt, and they remain still today largely unexplained, with queer anomalies that make them virtually unique, without parallels elsewhere that might give some lead to their identity. (R12)

Those features that Mallows calls "queer anomalies" are, in our view, only "curiosities." Nevertheless, they are so intriguing that we now describe some of them briefly.

Site nonrectangularity. In its eschewing of Euclid, Great Zimbabwe is unique among the world's ancient ruins. The Great Pyramid is precisely geometrical, Stonehenge is nicely circular, and even North America's medicine wheels display considerable orderliness. This curious

feature of Great Zimbabwe is not trivial because it probably reflects not only the cosmology (or lack of it) of the builders, but also the apparent absence of a need for an instrument to predict the seasons. Nothing at Great Zimbabwe seems to be aligned with anything. Archeoastronomers come up empty-handed. Perhaps those who constructed Great Zimbabwe were not interested in finding order in the cosmos, as were their fellow Africans to the north along the Nile.

Incoherence of the Valley Ruins. Compared to the military regularity seen in the Hill Fortress, the Valley Ruins lying below it "at first sight present an inextricable series of spaces and passages without coherence, sequence, or sense." The accompanying illustrations confirm this general assessment of W. Mallows. (R12)

The Great Enclosure, which dominates the Valley Ruins, epitomizes this incoherence; that is, absence of overall order as opposed to simple nonrectangularity. (There is a difference.) The Great Enclosure is only roughly elliptical, being severely flattened in the direction of the Hill Fortress. Inside, its rooms, if you can call them that, are highly irregular, disparate, and displaying no evidence of systematic planning. (R12)

It is difficult to say what this incoherence means---perhaps nothing at all. In this aspect, Great Zimbabwe can be compared to the tortuous streets of early European and American cities, which are never rated anomalous for this property.

The Conical Tower.

The main Conical Tower, by its very size, now 30', perhaps once 35' high, and 57' in circumference at its base, has caught everyone's imagination because it seems entirely useless. It is solid throughout, with nothing underneath below its shallow foundations and nothing on top. It is not strictly circular in plan nor conical in section; the batter increases in the upper half to give a curved profile, [i.e., it "bulges"]] so even that seems to have been design, not accident. The same stone workmanship and shallow foundation are seen at the Great Wall, and standing as it does only four feet from that wall, it must be considered part of the same build-

ding operation. There is nothing else like it for size and character in Africa, or for that matter in the world. It remains one of the primary enigmas of Great Zimbabwe. (R12)

Those who erected the Conical Tower left no architectural clues as to its purpose and no writing exists at Great Zimbabwe to help us in this matter. Many are the speculations. In X2, we saw it compared to the Baal towers of Arabia and Babylon, but when this guess was proffered Great Zimbabwe was believed to be thousands of years old. D. Cohen wonders if the Conical Tower might be a phallic symbol, or maybe an imitation of the Islamic minarets on the Mozambique coast to the east. (R9) This structure also might be a cenotaph to some departed leader or, like the Egyptian obelisks, commemorative of some event. The Conical Tower also might

have had some religious significance, but we will never know. (R13) It is unlikely that it was a lookout tower because there is no easy way to scale it. In any case, the Hill Fortress looking down over the Great Enclosure has a much better view of the surrounding landscape.

Brickwork at Great Zimbabwe. A visitor to Great Zimbabwe familiar with the roughly laid dry-stone walls seen at so many sites in Europe and North America cannot help but be amazed at the precision of the African stonework, particularly that in the Great Wall and the Conical Tower. There and elsewhere chunks of granite obtained nearby were hand-worked until they were standardized in size, shape, and weight to within narrow margins. These shaped stones were then laid in regular courses like fired-bricks to construct the Great



North entrance of the Great Enclosure illustrating the fine dry-wall masonry employing brick-like stones. (Zimbabwe National Archives)

Wall. Furthermore, no mortar of any kind was used. The stonework at Great Zimbabwe is therefore decidedly different from ancient sites elsewhere.

It is true that the Inca also built their precision-fit stone walls without mortar, but they employed multiton, shaped stones requiring the efforts of many workers to transport and emplace. In contrast, the stones at Great Zimbabwe were small enough for one man to handle easily. Interestingly, the Incan walls were being raised at about the same time that Great Zimbabwe was under construction. These contemporaneous African and South American walls are still standing, although one suspects those in Incaland are more stable when assaulted by earthquakes.

The acoustic cave. We have remarked on the strange acoustic effects occurring at several ancient sites; for example, Mystery Hill (MSS3-X3), Chichen Itza (MSP1-X2), and some Neolithic passage graves (MSU3). These structures were deliberately engineered to produce these special effects. At Great Zimbabwe, we have an "acoustic cave" that performs a similar role, but which seems to be entirely natural in origin; i.e., it is fortuitous.

It is located under one of the large rocks that form the southern boundary of part of the Hilltop Fortress.

Anyone speaking there can be heard with distinct clarity in the Valley below and more particularly better than anywhere else, in the Great Enclosure. (R12)

That this phenomenon was known to the Great Zimbabweans seems likely, as it is quite pronounced. If it was used in rituals or for some other purpose, no one can say.

The sunken passageway. The Hill Fortress is, as its name implies, a military structure. Having a defined purpose, its design is more comprehensible to us today than the Valley Ruins and Great Enclosure located on the plain below. In fact, we see only one feature of this section of Great Zimbabwe that is unusual enough to enter here. W. Mallows provides us with its description.

In the centre of the Audience Chamber [of the Hill Fortress] is one of the unsolved details of Zimbabwe: a

queer sunken passage or trench, starting from where one enters from the west and ending against a buttress near the centre of the enclosure. Its length is 25'0" to the buttress; its depth, 6'10"; and its width varies from 4'0" on the west to 6'3" where it finishes near the centre of this chamber. (R12)

This trench is sizable, and there are large, flat stones nearby that suggest that it may have once been covered. It is difficult to imagine what this structure was used for.

Indefensibility of the Hill Fortress. Although the Hill Fortress is manifestly what its name implies, it is seriously deficient as a military structure. There are controlled entrances, but there are also several weak points where attackers could easily penetrate the fortress. In fact, the northwestern side is virtually undefended, and the whole fortress is overlooked by the highest point of the hill, where there are no defenses at all. Finally, there are no natural sources of water within the Hilltop Fort, making it vulnerable to sieges. (R12)

Lack of burials. If a settled population existed at Great Zimbabwe, most of its dead were not buried there. Burials are very rare. One implication of this missing graveyard is that Great Zimbabwe was designed mainly for rituals and perhaps permanently sheltered only a few priests. (R12) In this, it would have been akin to several other ancient sites, such as Chaco Canyon, in New Mexico, which seems to have been occupied only sporadically.

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*Aerial view of the Hill Fortress from the west.
(Zimbabwe Tourist Board)*

MSS5

Mohenjo-daro: The First Planned City

Description. In Pakistan, a 4,500-year-old, rigorously planned city, complete with a well-engineered drainage system, and, supposedly, signs of a catastrophe of mysterious nature.

Data Evaluation. The major architectural features of Mohenjo-daro have been well-reported in the mainstream science literature. Rating: 1.

The highly anomalous reports from Mohenjo-daro---signs of radioactivity and application of intense heat---however, come from the so-called "fringe literature." Rating: 3.

Anomaly Evaluation. The precocious nature of Mohenjo-daro city planning and the apparent regimentation of the populace are impressive but not especially anomalous when compared to those of contemporary Egypt and Mesopotamia. Rating: 3

In contrast, the signs of excess radioactivity and vitrification suggest the possession of highly advanced technology by someone. Rating: 1.

Possible Explanations. The reports of radioactivity and vitrification are false or greatly exaggerated. If they are not, we can consider the speculations, seen in the sensational literature, that millennia ago the Indian subcontinent was overflown by aircraft ("vimanas") and the scene of battles using technically advanced weaponry!

Similar and Related Phenomena. Other examples of intense heating and vitrification: Colorado's fire-hardened structures (MSB1-X7); Scotland's vitrified forts (MSF3); the Tower of Babel (MST5-X3).

Entries

X0. Introduction. Mohenjo-daro was one of the great cities of the ancient world. Along with its sister city, Harappa, 350 miles to the northeast, it dominated the Indus Valley between 2600 and 1900 B.C. During this period, Mohenjo-daro and Harappa were probably the largest cities in the world. Their reach extended along the Valley for a 1,000 miles. Both Mohenjo-daro and Harappa are in today's Pakistan, but their major trading port, Lothal, is located in India. Lothal is noted for its immense artificial "dock" or "harbor." (MSC9-X2 in Ancient Infrastructure)

Although the existence of Mohenjo-daro was known to archeologists as early as 1876, it lay unexplored until the early 1920s when major excavations began. (R7) It is easy to understand why this remarkable site was neglected. The climate is terrible. Temperatures can reach 120°F in the summer and drop to freezing in the winter. The scenery is

not any better. Today, Mohenjo-daro is spread out over a salt-covered desert.

But the environs of Mohenjo-daro were not always so forbidding. Millennia ago, the region was forested; but the trees were felled by the builders of Mohenjo-daro into order to fire the bricks that make up virtually every structure in the city. In this heavy dependence upon bricks, the buildings of Mohenjo-daro, Harappa, and the lesser cities in the Valley are structurally like the huge pyramids of sun-dried bricks in Peru's Moche Valley. (MSP1-X3)

In translation, Mohenjo-daro means "Hill of the Dead." Strangely for a city that once housed perhaps 40,000 souls in its heyday, only about three dozen skeletons have been found in the ruins. Even more strangely, most of the skeletons were discovered laying unburied in contorted poses. Judging from the bones, these individuals had been cut down by swords and axes. (R3) These skeletons

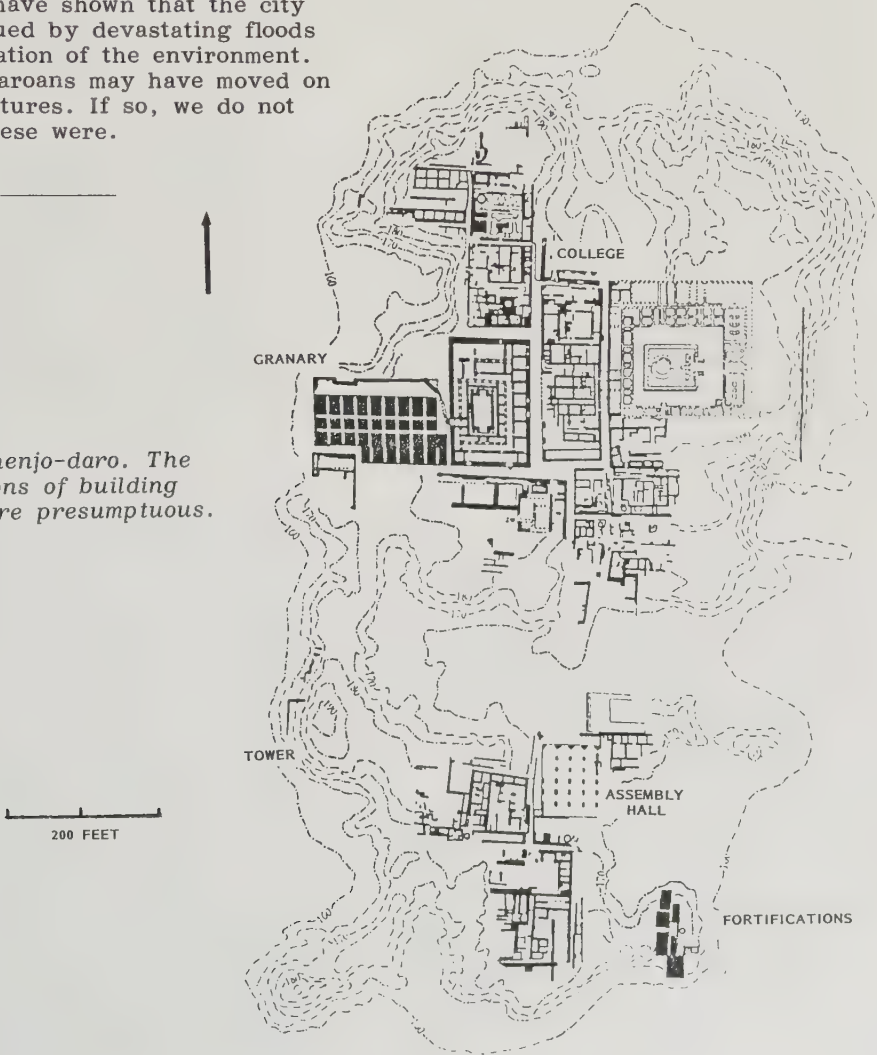
are but one sign that Mohenjo-daro met a violent end.

Some other curious features of the city that are unrelated to our focus on "structures" are: (1) an absence of offensive weapons (R3); (2) an absence of palaces and temples; and (3) the existence of cylinder seals and other objects bearing stylized symbols. The Mohenjo-daroans had invented a pictographic sort of script---one that has never been translated. Actually, anthropologists do not even know what language the inhabitants of Mohenjo-daro spoke or even where the people came from originally. Whoever they were, they were replaced by Aryan invaders circa 1900 B.C. By that time, Mohenjo-daro may have been mostly a dead city. Archeologists have shown that the city had been plagued by devastating floods and a deterioration of the environment. The Mohenjo-daroans may have moved on to greener pastures. If so, we do not know where these were.

X1. Mohenjo-daro structures. Mohenjo-daro was neatly laid out on a square grid; it was probably our planet's first planned city. Twelve, wide main streets of beaten earth all neatly intersected at right angles, or at least pretty close to 90°. The residences were standardized---almost monotonously so. The building codes were very strict, suggesting a strong central government. Because of its regularity, Mohenjo-daro has been called a "Bronze Age Manhattan." (R6) While hardly anomalous, this early evidence for systematic city planning is certainly worthy of note.

Even more remarkable, many residences boasted private bathrooms con-

Plan of Mohenjo-daro. The identifications of building functions are presumptuous.



nected to a city-wide drainage system. It was all very precocious.

To serve the populace, the city fathers provided a large communal bath, an assembly hall, and a huge central structure for processing and drying the grain that was grown in the surrounding fields before the climate deteriorated.

Anthropologists suspect that the inhabitants of Mohenjo-daro were as tightly controlled as the design of the city itself. Mohenjo-daro seems to have been a very old "Brave New World."

Mohenjo-daro's precociousness and regimentation are remarkable but probably no more so than we see in ancient Egypt and Mesopotamia. However, two other discoveries said to have been made at Mohenjo-daro, which, if verified, are highly anomalous. D.H. Childress has mentioned these in one of his "Lost Cities" books. He cites as sources some popular books from the fringes of science. So, caveat emptor!

First, Childress states that some of the unburied skeletons found at Mohenjo-daro were highly radioactive---"on a par with those at Nagasaki and Hiroshima."

Secondly, he writes:

Thousands of lumps, christened "black stones," have been found at Mohenjo-daro. These are, apparently, fragments of clay vessels that melted together in extreme heat and fused. (R5)

Childress and others speculate that the skeletons and fused objects indicate that Mohenjo-daro was the target of advanced weapons of some sort 4,000 years before our modern lasers and nuclear weapons. Unfortunately, we do not know the primary sources for these astounding observations.

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MSS6

Nan Madol: A Megalithic Venice

Description. Along the fringe of Pohnpei, one of the Caroline Islands, the presence of 92 artificial islets supporting temples, dwellings, mortuaries, and other structures; all constructed from large, undressed basalt prisms. The islets are connected by a network of man-made canals. This vast megalithic complex is named Nan Madol.

Data Evaluation. Although not as well known to the general public as Stonehenge or Mystery Hill, Nan Madol has been well-researched by mainstream archeologists. A substantial literature is available. Rating: 1.

Anomaly Evaluation. The quarrying, transportation by raft, and handling of the multi-ton basalt prisms were well within the capabilities of Micronesians in the heyday of Nan Madol: 1100-1600 A.D. The basalt prisms were not dressed; stone-working was at a minimum. Our preferred descriptor for the engineering at Nan Madol is "unsophisticated"; others have used the word "crude." The sheer size of the complex, though, is most impressive. The use of naturally formed basalt prisms as structural elements seems to be unique to Nan Madol and a few other Micronesian islands. Rating: 3.

Possible Explanations. None required.

Similar and Related Phenomena. The geology of prismatic basalt (ESP10-X1 in Anomalies in Geology); the Latte Stones on Guam and other islands in Micronesia (MSO5 in Ancient Infrastructure).

Entries

X0. Introduction. The Micronesian island of Pohnpei (formerly Ponape) lies 2,700 miles southwest of Hawaii in the Carolines. Only 129 square miles in area, it is almost lost in the immensity of the Pacific. Pohnpei is not an atoll; rather, it is of volcanic origin, with one peak reaching 2,595 feet. From the air, the island seems mostly blanketed by dense jungle and mangroves. But this screen of vegetation conceals one of the architectural marvels of Oceania: the megalithic complex called Nan Madol.

Actually, closer scrutiny of Pohnpei from lower altitudes does reveal some hints of artificiality around Pohnpei's edges---some semblance of rectangularity among the fringing mangroves. At sea level, as these suggestions of artificiality are approached by boat, the real immensity of Nan Madol becomes evident. Hundreds of strange squarish edifices made from basalt prisms rise from 92 man-made islets. Miles of man-made canals unite the dispersed elements of Nan Madol into a unique megalithic complex. The Nan Madol ruins cover about 170 acres (not 11 square miles widely proclaimed in old reports). The palaces, temples, mor-



Map of Pohnpei Island in Micronesia, pinpointing the extensive ruins of Nan Madol

tuaries, breakwaters, and residences are all constructed from multi-ton "logs" of basalt arranged in "log-cabin" style. Nan Madol is testimony to the immense labors of past generations of Micronesians. The present residents of Pohnpei know little of the history of the ruins and suspect that they are inhabited by spirits. However, they are happy to guide the many tourists among the many islets by boat.

The construction techniques employed at Nan Madol deserve the adjective "unique"---unique to Micronesia, that is. The island of Kosrae, 340 miles south-east of Pohnpei also boasts a similar, but less ambitious, city of basalt logs called Leluh. We will concentrate here on Nan Madol as representative of the genre. It has been described as the "Venice of the Pacific"; and by virtue of its canal network it deserves that title.

An aura of mystery has been cast over Nan Madol by popular writers. It has even been associated with the supposed sunken Pacific continent of Mu. There are also rumors of extensive underwater ruins lying just offshore and of tunnels connecting the various islets. As on Hawaii and other Pacific islands, one also hears the legends of dark-skinned, distinctly unfriendly "little people." Such speculations and native traditions sell books even though there seems to be little of a factual nature to support them. In fact, a dispassionate study of Nan Madol reveals that it is really not very mysterious at all. The architecture may be unique but, in truth, it is rather primitive, as we shall now demonstrate.



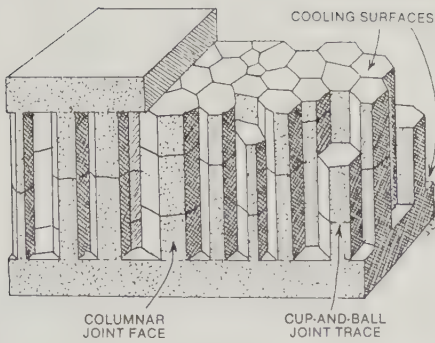
Structures on Nan Madol are composed of stacks of prismatic basalt "logs."

Basalt, when it cools, develops what is called "prismatic jointing." These prisms may be a foot or two in width and many feet long. Six flat sides are found on most of the prisms, but there may be as few as three sides and as many as eight. At the well-studied Giant's Causeway in Northern Ireland, the classical example of prismatic jointing, only 51% of the prisms are hexagonal in cross section. Basalt prisms are not large crystals. Instead, they are more closely analogous to the polygonal mud cracks seen in dried-up puddles. However, no scientific consensus exists as to their exactly how the prisms are formed. (See ESP10-X1 in Anomalies in Geology)

Whatever the origin of prismatic jointing, the Pohnpeians had ample supplies of naturally shaped basalt "logs" with which to build Nan Madol. They just stacked them together without dressing or processing them further. Large basalt boulders, some weighing upwards of 50 tons, were also incorporated into the walls of stacked prisms. These irregular boulders and the varying dimensions of the prisms made for rather jumbled, even crude, structures. The walls display many chinks and gaps. In reality, while Nan Madol may be a large and impressive megalithic complex, it is also not very sophisticated. It is more on the engineering level of Britain's circles of rude, undressed stones but yet lacking their astronomical features.

X1. The construction of Nan Madol

The building blocks. Today's children play mostly with Legos, but before Legos came Erector Sets and Lincoln Logs. All are still in the toy stores. With the Lincoln Logs, you can build all manner of miniature structures with the several standardized wooden pieces that are shaped so that they fit neatly together. The not-so-ancient inhabitants of Pohnpei used the same idea to build Nan Madol, but instead of wooden logs they built their great edifices from large basalt prisms quarried from the several volcanic basalt flows available on the island.



Details of a basalt flow that solidified into prisms. Not all prisms are six-sided.

Quarrying, transportation, and handling.

The Pohnpeians obtained their basalt prisms from seaside quarries. These prisms were often not detached from the basalt flows and had to be freed using fire and dousings of cold seawater. Once loose, they were moved to the shore and loaded aboard rafts for transit to Nan Madol---distances of 15-30 miles. Most of the basalt prisms weigh well under 10 tons and were rather easily man-handled using levers, ropes made from hibiscus fibers, and inclined planes made from the trunks of coconut palms. (R12)

Not all prisms completed the trip from the quarries to Nan Madol. One can see lost prisms on the floors of the lagoons inside the fringing reefs along the routes from the quarries to Nan Madol. No one seems to have counted the number of prisms that made the trip successfully, but there must be many thousands of them stacked on the 92 artificial islets and along the miles of man-made canals and breakwaters.

Once at the construction sites, the prisms were off-loaded and pulled and levered into parallel rows that are linked with crosspieces in an arrangement bricklayers call "headers and stretchers." Log cabins are constructed in the same manner today. The creation of the Nan Madol lithic complex was obviously labor-intensive but elementary from an engineering standpoint. (R12)

The Nan Madol complex as a whole.

In the quotation that follows, P. Bellwood describes the overall disposition of Nan Madol's islets, basalt platforms, and enclosures.

The platforms are arranged in two main groups, the northern one being a priestly and burial area called Madol Powe, the southern being a royal dwelling and cult area called Madol Pah. On one side the town abuts against an island, while most of the remainder of its rectangular boundary is marked by two lines of rectangular platforms forming a breakwater, with canoe channels left between. The longer of these breakwaters is 1,400 metres long [almost 1 mile!], while the shorter is 500 metres long. The short northern edge was apparently left open to the elements, and a number of structures in the complex in fact appear to have been left unfinished.

The more important platforms, for royal or ceremonial use, generally have high enclosure walls of basalt prisms which rise above the basic level of the platforms, to a height of 11 metres in one case. These walls are the spectacular elements which have always caught the eyes of visitors, and they are mostly of the cribwork formation with headers and stretchers of prismatic basalt. (R8)

A breakwater almost a mile long, walls 11 meters (36 feet) high, 92 artificial islets; these statistics speak to the ambitious scale of Nan Madol.

Nandauwas (or Nan Douwas). The grandest structure of Nan Madol is without question a tomb called "Nandauwas." Bellwood states, "It would be no exaggeration to say that it is one of the most remarkable pieces of prehistoric stone architecture known anywhere in Oceania." (R8)

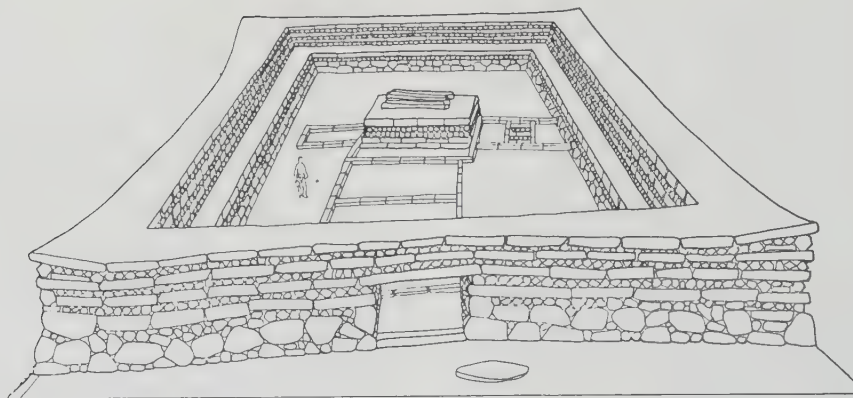
Squarish, like most of Nan Madol's structures, Nandauwas' foundation is 1.75 meters high and about 65 meters on a side. It is one of the few structures at Nan Madol to be astronomically oriented according to the cardinal points. Nandauwas' outer courtyard wall is 8.5 meters high. To the east is a great protective wall 10.5 meters thick and 4.5 meters high. (R8)

That Nandauwas is not merely a pile of basalt prisms without aesthetic appeal can be seen in a paragraph from W.N. Morgan's definitive volume on prehistoric Micronesian architecture. (R12)

The crowning architectural achievement of Nan Madol is Nandauwas, the



Plan of Nan Madol. The "bushy" areas represent mangroves. (Adapted from R7)



One of Nan Madol's mortuaries. Nandauwas is similar in style but larger. (Adapted from R12)

royal mortuary compound of the sandeleur and, later, of the nahnmwarki. Certainly no more magnificent example of prehistoric architecture exists in all of Micronesia. The gracefully up-swept walls of the extraordinary monument exceed 25 feet in height at their corners and entryways. The design is powerfully conceived, sensitively sited, and skillfully executed. (R12)

In the foregoing quotations, both Bellwood and Morgan employ the adjective "prehistoric." But Nan Madol hardly deserves that term. Although some construction may have begun as early as 500 A.D. (R14), the megalithic phase that gave us the structures that attract our admiration today did not commence until about 1100 A.D. Apparently, the Pohnpeians were still wrestling their basalt prisms into place as late as 1600 A.D.---hardly a prehistoric date.

X2. Is Nan Madol anomalous? The first and most obvious question to be asked about Nan Madol is: Why 92 artificial islets? Ample terra firma was available to the Pohnpeians. We cannot answer this question, so a minor anomaly can be declared here.

What we see in Nan Madol is a massive megalithic complex that probably required the labors of about a thousand men for several centuries. But great labors and long construction times are not anomalous per se. What we see above ground at Nan Madol reveals no special engineering sophistication beyond that expected from the Micronesian culture of the period. What is potentially anomalous at Nan Madol is the purported existence of tunnels and offshore megalithic structures. University of Oregon archeologist W.S. Ayres does not dismiss these rumors and recent observations by divers out-of-hand. He writes:

Pohnpei's oral tradition also describes mysterious underwater tunnels connecting the islet cluster to Nahkap Bay to the northeast. We are examining the possibility of tunnels as well and other underwater architectural formations. Newell Wright, a specialist in underwater archaeology, is investigating a report of 12 vertical

columns forming a row on the reef floor in 100 feet of water. If these columns are not natural coral stalagmites, their placement would suggest that the islanders were more sophisticated in their engineering ability than we had suspected. (R14)

In other words, Nan Madol might be more mysterious than the above-ground ruins suggest.

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Part of a temple on Nan Madol. (A.P. Leib, Bishop Museum)

MSS7 Large-Scale Order of Cities and Complexes

Description. The apparently intentional siting of cities and complexes in geometrical patterns for philosophical, mystical, commercial, or military purposes. Large-scale order may also have evolved unintentionally due to mutually convenient separation distances between cities, as observed in the Mayan culture.

Data Evaluation. Several scientists have noticed and studied the hexagonal arrangement of cities in the Late Classic Lowland Mayan culture. However, we have found no other similar large-scale patterns reported in the science literature. Rating: 2.

Anomaly Evaluation. The large-scale order in the Mayan culture, though quite obvious to modern anthropologists, seems to have been the unintentional consequence of the desire to improve logistics and social control. Rating: 4.

Similar and Related Phenomena. Large-scale organization of British stone circles (MSH15 in Ancient Infrastructure). The many claims in the fringe literature that ancient sites, especially major pyramids, are located at the intersections of a worldwide grid.

Entries

X0. Background. The geographical disposition of stone circles and other simple megalithic structures in Britain has suggested to some that they were not placed at random. For almost a century, a controversy has been fought over whether or not the megalith builders intentionally sited their structures along straight lines or so-called "leys." (MSH15 in Ancient Infrastructure) Most mainstream scientists categorically reject this claim of intentional linearity. This disbelief comes easily when it is realized that there are so many megalithic monuments in Britain that it is simple to draw over a thousand ley lines containing four or more qualifying sites. Statistically, leys are unavoidable. For this reason, the Data Evaluation rating for the intentional reality of leys in Britain was a dismal "4" in Ancient Infrastructure.

In the present chapter dealing with the possible large-scale order of cities and complexes, a similar assault upon our credence occurs. Here, we have claims that global, neatly geometrical grids exist upon which major archeological sites, such as Stonehenge, Chaco Canyon, the Giza Complex, Tiahuanaco, etc., were intentionally sited at intersections of the grid lines. How are these grid lines determined? It seems that dowsers and others with psychic powers can

sense streams of "earth energy" running along these imagined grid lines. Again in Ancient Infrastructure (MSH13) we demonstrated how Stonehenge, for example, is supposedly located at the confluence of such streams of earth energies, as charted by dowsers. This methodology is beyond the pale of science. The foremost reason being that logical positivism insists that scientific phenomena must be observable to all normal people. This is not the case in dowsing. Therefore, we do not catalog such claims for large-scale order.

Claims for the large-scale order of ancient sites also arise from appeals to numerology and geodetic coincidences. For example, one off-mainstream researcher, C. Munck, asserts that the planet's many pyramids are connected by mathematical relationships. (R3)

X1. The objective existence of large-scale order. Although we attach little weight to earth-energy grids, numerology, and occult forces as determinants of large-scale order in archeology, such order does exist---and for objective reasons.

When a map of the Late Classic Low-

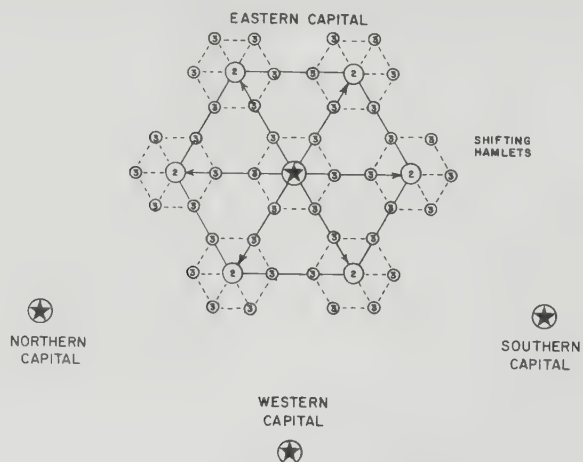
land Maya sites is studied, surprising hexagonal patterns are easily discerned. In her analysis of these geometrical regularities, J. Marcus divides the Maya sites into primary, secondary, and tertiary groups according to their size and purpose. She writes:

The smallest unit of settlement---one usually overlooked by archeological surveys in the lowland rain forest---was probably a cluster of thatched huts occupied by a group of related families; largest clusters may have been divided into four quadrants along the lines suggested by Coe. Because of the long fallow period (6 to 8 years) characteristic of slash-and-burn agriculture in the Peten, these small hamlets are presumed to have changed location over the years, although they probably shifted in a somewhat circular fashion around a tertiary ceremonial-civic center for whose maintenance they were partly responsible. These tertiary centers were spaced at fairly regular intervals around secondary ceremonial-civic centers with pyramids, carved monuments, and palace-like residences.

In turn, the secondary centers occurred at such regular intervals as

to form hexagonal patterns around primary centers, which were still larger, with acropolises, multiple ceremonial plazas, and great numbers of monuments. In some cases, the distances between secondary centers was roughly twice the distance between secondary and tertiary centers, creating a lattice of nested hexagonal cells. This pattern which conforms to a Western theoretical construct, was presumably caused by factors of service function, travel, and transport. The pattern was not recognized by the Maya at all. They simply recognized that a whole series of smaller centers were dependent on a primary center and therefore mentioned its emblem glyph. Linking the centers of the various hexagons were marriage alliances between members of royal dynasties, who had no kinship ties with the farmers in the hamlets.

Out of the large number of primary centers available to them, the Maya selected four as regional capitals. True to their cosmology, the Maya regarded these capitals as associated with the four quadrants of their realm, regardless of their actual location. Each was the home city for a very important dynasty whose junior mem-



Idealized diagram of the territorial organization of lowland Classic Maya, from primary capitals (stars), to regional capitals (2s), to outlying hamlets (3s). All primary capitals are in the centers of hexagonal arrays, as shown for the eastern capital. (R1)

bers probably ruled secondary centers. Since the hexagonal lattices were probably adjusted to variations in population density, each of the four quadrants of the Maya realm probably controlled a comparable number of persons. So strong was the cognized model that, despite the rise and fall of individual centers, there seem always to have been four capitals, each associated with a direction and, presumably, with a color. (R1)

This large-scale order in the arrangement of Mayan cities has also been noted by other archeologists and anthropologists. (R2) Unlike the leys in Britain, this Mayan orderliness is not ascribed to coincidence by mainstream science. Certainly, earth energies and numerology are not required to explain the regularities mentioned above by Marcus.

While the primary centers (the four capitals) were sited for cosmological reasons, the secondary and tertiary centers were placed at roughly equal distances from each other. This standard

distance was probably not arbitrary. It was a distance of convenience---for good communication, easy logistics in commerce, and a rational, hierarchical system of social governance and control. The geographical effect of the equidistance rule, led to the hexagonal array of cities shown in the illustration. In other words, the hexagonal pattern was not intended but was rather the natural consequence of the equidistance law.

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MST ANCIENT TOWERS

Key to Phenomena

MST0	Introduction
MST1	The Newport Tower
MST2	Incongruous Towers of the North American Southwest
MST3	Chulpas: Stone Towers of South America
MST4	Ancient European Stone Towers: A Survey
MST5	Ancient Towers of the Middle East
MST6	The Towers of Easter Island

MST0 Introduction

The obvious purpose behind building towers is the acquisition of height. Height has always been useful to humans for seeing greater distances, for obtaining military advantages, and simply for impressing people.

However, the higher the tower, the more difficult it is to construct and still maintain stability, particularly in areas prone to earthquakes. Stability is enhanced when masonry walls are made very thick and, especially, when mortar is added. Ancient engineers used both techniques in their attempts to gain structural altitude, but they were rarely able to exceed 100 feet. Generally speaking, though, the ancient towers cataloged here display no sophisticated technology that would excite an anomalist.

The puzzles that are proffered by ancient towers are not found in their engineering but rather in their purposes, the identities of their builders, and the tales they tell us about the cultures that necessitated their construction. For example, the hundreds of stone towers in the North American southwest reveal a society wracked by almost perpetual warfare and even genocide. Rhode Island's Newport Tower, however, has engendered three centuries of controversy concerning its age, its builders, and its initial purpose. Unexpectedly, stone towers are found among the great stone statues on Easter Island. There, bizarrely, some were raised for the sole purpose of stashing navel strings!

MST1

The Newport Tower

Description. In Newport, Rhode Island, the presence of a squat stone tower of controverted origin, age, and purpose. Curiously styled, the tower rests upon eight columns connected by arches. It does resemble some European medieval structures, but the preponderance of archeological evidence supports an early colonial origin. Professional archeologists adamantly defend its colonial origin, while a coterie of mostly amateur archeologists champion a Norse origin.

Data Evaluation. The Newport Tower has been argued about for almost three centuries. Consequently, both the professional and popular literatures provide abundant material for anyone interested. We have used only a small portion of what is available, hoping that we have covered the major points made by both sides of the controversy; that is, the pro-Norse and pro-colonial views.

The data gathered by professional archeologists is of high quality and is based upon excavations at the site. These data emphatically support a colonial origin for the Newport Tower. There exists, however, a collection of diverse observations and conjectures that points to a Norse origin. Compared to the data gathered in the field by skilled archeologists, the pro-Norse data---the anomalous data---seem rather weak. Nevertheless, there is a sufficient quantity of it to warrant this catalog section. Rating: 3.

Anomaly Evaluation. A Norse or any pre-colonial origin for the Newport Tower would be highly anomalous in view of the passionate commitment of mainstream science to a colonial origin and the absence of a Norse presence of any kind in New England. Rating: 1.

Similar and Related Phenomena. Other New England structures said to be of pre-colonial origin: Mystery Hill (MSS3); many stone chambers (MSU1); stone roads (MSR1 in Ancient Infrastructure). Supposed Norse mooring stones (MSO1 in Ancient Infrastructure). Various inscriptions, such as the Kensington Stone, etc. (MGW in another volume). Supposed Norse weapons and metal implements (MMM in another volume).

Entries

X0. Introduction. Up on a hill at a place called Touro Park, in the town of Newport, Rhode Island, sits a strange stone tower perched upon eight columns separated by arches. This is the Newport Tower or, as it is sometimes called, the "Old Mill." The tower is undeniably of curious design. A controversy as to its age, purpose, and builders has engulfed it for two centuries. Was the Newport Tower built by the Norse a millennium ago or were the builders early colonists circa 1650? In several ways the argument is typical of many in science and, especially, in archeology.

The status of the conflict today is this: In the late 1940s, an establishment archeologist, W.S. Godfrey, Jr., conducted studies and excavations at the tower in the accepted, careful manner

that archeologists are supposed to use at their digs. His trenches yielded artifacts and other data that seemed to show beyond any doubt that the Newport Tower was built by colonists about 1650. This finding is eminently satisfactory to mainstream archeologists, for today's consensus insists that the Norse never established settlements in North America farther south than L'Anse aux Meadows in Newfoundland.

It has not always been this cut-and-dried in archeology. In the Nineteenth Century, a Norse presence in New England was not politically incorrect. Indeed, there remains today a rather long dossier of niggling, contradictory observations that have not been explained by the "colonial" theory of the Newport Tower. This residuum explains why we

make room for this engaging archeological phenomenon; a subject upon which the "Book of Science" has been officially closed.

In some ways, the Newport Tower controversy resembles the long battle over whether or not the first humans ventured into the Americas across the Bering Land Bridge. For many years, the so-called Clovis Police made sure all archeologists subscribed to that 11,500-year-old trek from Asia into Alaska. But new discoveries have bit-by-bit weakened that paradigm, and, now, other, earlier routes to the New World are being entertained. The same scenario has occurred with supposed Norse settlements in North America. Long opposed by the Columbus-was-first paradigm, the reality of the Norse settlement at L'Anse aux Meadows, in Newfoundland, is now recognized. It remains to be seen whether the still-outstanding anomalous observations associated with the Newport Tower will lead to an official extension of Norse influence farther south into New England.



A modern view of the Newport Tower.

X1. The Newport Tower viewed in 1879. A rather charming article describing the Newport Tower, then called the "Old Mill," appeared in an 1879 issue of Scribner's Monthly. (R1) It provides all we really need to know about the design of the tower, and this in the elegant literary style of that time.

Standing amid the neat, picturesque cottages of today [1879] this mysterious relic of antiquity, so rough and unsightly, seems a cumbrous thing. Its somber aspect is in striking contrast with all around it. Like a huge, bleak rock amid rushing, laughing waters, it remains, the dead among the living.

With those who frequent Newport, ---that most delightful of all watering places,---the origin of the "Old Mill" is the theme of endless discussion. Was it built by the English colonists? Did the Indians build it? Was it erected by the Northmen? For what purpose was it constructed? These are questions often asked. Can they be satisfactorily answered? It is the purpose of this paper to review the history of this building, so far as known, and show its probable origin and design.

The "old Mill" is on elevated ground within the city of Newport, R.I., in an ornamental enclosure called Touro Park, near the commencement of Bellevue avenue, a magnificent highway leading to the sea between miles of "cottages."

The structure is a ruin. It is simply a roofless, cylindrical stone-wall, elevated upon eight semicircular arches, sustained by a like number of stout round columns. The wall, arches and columns are built with small broken stones, laid in mortar in the manner technically called "uncoursed rubble work." The cylindrical wall is twenty-three feet diameter outside, and eighteen feet and nine inches inside. The eight columns are each three feet and two inches diameter, and ten feet high. The arched openings are twelve feet six inches high from the ground. The entire height of the building is about twenty-four and a half feet. The columns have rough and irregular projections at top and bottom, indicating the rudiments of the capital and base. There are a few patches of hard white plastering still adhering to the

walls and columns. From this it is evident that the rough surfaces were once covered with a coat of plaster, and were probably smooth and white. The masonry is crude and unsightly. It appears to have been laid by unskillful mechanics, or those at least who worked without proper mechanical implements. The plan, however, is regular and shapely. The curves of the wall, arches and columns are remarkably true for work executed with such rough materials. The building evidently had an intelligent architect. (R1)

X2. The Norse Theory. The anonymous author quoted above goes on to relate some of the known historical facts about the Newport Tower. It is well-established that in 1678, Governor Benedict Arnold, the great grandfather of the traitor of the same name, was the owner of the tower. In his will, he called it "my stone-built windmill." This proves that it indeed was a windmill in the late 1600s, but was it really built for that purpose? Its peculiar architecture seems to belie that specific application. G.G. Channing, in his "Early Recollections of Newport," wrote:

The very style and grace of the structure preclude the idea that it could have been erected upon an almost barren waste merely to grind Indian corn. (R1)

Of course, this is simply an opinion and not a fact.

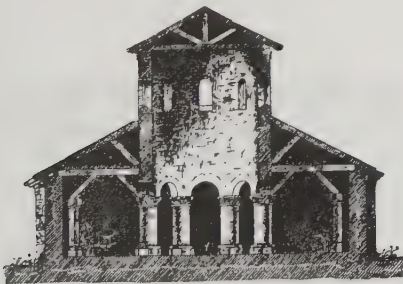
But if it was not built as a mill, what might its purpose have been? And who built it?

A popular answer to the last question ---one easily accepted in 1879 but totally rejected today---was championed by the Danish scholar C.C. Rafn.

Professor Rafn, Secretary of the Royal Society of Northern Antiquaries at Copenhagen, claims that this "Old Mill" was erected by the Scandinavians or Northmen in the Eleventh Century.

Professor Rafn has shown---and his conclusions are now generally accepted as incontestable---that the portion of our country now known as Massachusetts and Rhode Island was discovered by the Scandinavians late in the Tenth Century, and that a colony of Northmen was established early in the Eleventh Century in the neighborhood of Rhode Island, and there remained some years. (R1)

If the Norse did plant a colony in the Newport area and, being devout Christians, they would have desired a church and a baptistry. There is no trace of a Norse church in the environs of Newport, but it seems that the Newport Tower is a dead ringer for the core structures of some medieval European baptistries. If one adds an encircling wooden structure to the tower (see sketches), one has a virtual clone of structures common in Europe around the



(Left) The Newport Tower ("Old Mill") as it would look if restored as the proposed "Vinland Baptistry."
(Right) A baptistry built in northern Italy in the Sixth or Seventh Century. The stone cores are similar.
(R1)

time of the Vinland sagas. Since wood decays quickly, one would not expect obvious traces of such a structure to remain today. The anonymous 1879 author concluded as follows:

There can be no further doubt of the origin and purpose of the "Old Mill." It should henceforth be designated by its proper name, and be known only as the Vinland Bapistry. This antique relic, the most ancient Christian building in the United States, is eight centuries old. It deserves the care due to a most valuable historic monument. (R1)

Thus we have a forceful, clear-cut statement of the Norse Theory of the Newport Tower. But theories come and go and scientific climates change, no matter how unassailable they may seem at some point in time. Just 60 years after the above was penned, the Norse Theory was, like the tower itself, only a relic in the Halls of Science.

X3. The colonial or "Arnold" Theory. Mainstream archeologists today insist that no enigmas surround the Newport Tower. It is demonstrably the work of English colonists and served as a windmill for Governor Arnold. It is admitted, though, that it might have been used for other purposes earlier.

The Arnold Theory has a huge advantage over the Norse Theory; specifically, two seasons of digging (1948 and 1949) at the tower site by W.S. Godfrey, Jr., an archeologist from Harvard's Pea-

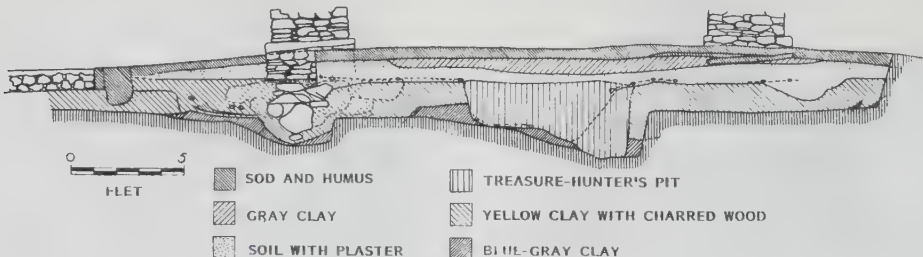
body Museum. His reports (R2, R3, R5, to name a few) recount a thoroughly professional investigation of the tower and its immediate environs.

Godfrey dug up hard facts; that is, artifacts; and they were all from the colonial period with nary a shard of Viking evidence. These artifacts; coins, bits of glass, a pipestem, a footprint, etc., all dating between 1696 and 1946; form a strong bulwark against criticisms from the adherents of the Norse Theory. Artifacts or the lack thereof easily trump circumstantial evidence such as those similarities between the Newport Tower and European bapistries. Godfrey concluded as follows.

Analysis of the masses of material from the trenches of 1949 may turn up more evidence, but none as dramatic as this. Our three main items: the footprint, the Colonial pottery in the construction trench, and the layer of Colonial brown earth, containing the gunflint among other things, passing under four of the columns, lead to only one conclusion: the mystery is no more. Either Governor Arnold built the tower or one of his contemporaries did. (R3)

Godfrey's conclusions and discoveries were questioned immediately by the pro-Norse faction. Godfrey's reply to criticisms by F.J. Pohl reflected the sharp division between the supporters of the Arnold and Norse theories.

Much of [Pohl's] pro-Norse evidence is extremely tenuous, and all is subject to more than one interpretation. Vague historical suppositions and



A section of the underpinnings of the Newport Tower made during the 1948 excavations. (R2)

elaborately reasoned theoretical abstractions, complicated theories derived from omissions in the record as well as blind acceptance and magnification of every hint and questionable suggestion, cannot merit equal weight with concrete archaeological evidence, especially when these circuitous reasonings can be (and have been) strongly questioned on a theoretical level alone. (R5)

No wonder establishment scientists adamantly and energetically reject the Norse Theory. (R4, R8, R9, R10, R13)

X4. Facts militating against the Arnold Theory. Of course, the Norse Theory did not fade away with the publication of Godfrey's results, nor did the many supporting declarations by establishment scientists. There are contradictory data, and the list of them is surprisingly long. However, no single anomalous observation can counter the total lack of Norse artifacts at the tower. But the accumulation of many, diverse bits and pieces that do not fit a paradigm can sometimes overturn it, as was the case with the triumph of continental drift in the 1950s. For this reason, this catalog must recognize these minor challenges to the colonial or Arnold Theory of the Newport Tower.

The similarity argument. The unusual architectural style of the Newport Tower resembles that of some medieval baptis-tries. But, as mentioned in X2, this is circumstantial evidence only. An English church and a colonial stone structure on St. Thomas, in the Virgin Islands, also strongly remind one of the Newport Tower.

The astronomical evidence. In 1994, astronomer W.S. Penhallow, from the University of Rhode Island, determined that the openings in the cylindrical wall of the Newport Tower were aligned so that the tower could have functioned as an astronomical calendar. Possibly, he opined, it was built to determine church holidays by a group of European settlers. If so, the tower would have been built before 1500, because after that date adequate almanacs were widely available. (R14, R17)

Radiocarbon measurements. In 1993, J.

Siemonsen announced that the Newport Tower was constructed between 1500 and 1630 $\pm$ 50 years. He based his assertion upon the radiocarbon dating of carbon dioxide extracted from porous mortar taken from the tower. (R14)

But it is difficult to collect gases in such a setting without mixing them with ambient air. Furthermore, we have to wonder how much gas diffused in or out of the mortar in three centuries.

Units of measurement. Several researchers have tried to find a standard unit of measure used in the building of the tower by analyzing various tower dimensions. The results are mixed. One team declared that the "foot" used by the builders was equal to 12.36 inches, which is the length of the foot used by Scandinavians in medieval times. (R6)

Testimony of old maps. According to A.H. Mallery, charts of Narragansett Bay made in 1614 and 1634 apparently show the Newport Tower. (R6) C. Keeler added that it was also a landmark on the map used by the master of the Mayflower in 1630. (R11) The 1569 map of G. Mercator may show the tower, too. (R19)

These dates suggest that the tower existed before English colonists settled the Newport area.

The results of radar probing. A scan by ground-penetrating radar of the area around the tower indicated the presence of buried features. These could be man-made or natural. If the former, it is possible the Newport Tower was once accompanied by other structures---perhaps a church. (R18)

The discovery of an inscription. In 1946, a possible runic inscription was noticed on a stone on the outside of the tower by P. Lovfold and M. Bjorndal. Translations vary, but one expert believes it is simply the date 1010. (R11)

Said inscription is rather crude. Its true age is impossible to determine. It might even have been made recently, assuming it is truly an inscription and not random scratches.

The presence of plaster fragments under column foundations. A.H. Mallery has asserted that the presence of bits of tower plaster under the column foundations imply that the foundations had been underpinned long after the tower

itself was built. Perhaps the tower was reinforced in this manner when it was converted for use as a windmill circa 1675, and the plaster fragments were accidentally added to the fill at this time. This postulated underpinning operation may also account for the presence of colonial artifacts under the foundations of a tower. In such a scenario, the tower itself might be 300 years or more older than the underpinning with its content of plaster and colonial artifacts. R6)

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MST2 Incongruous Towers of the North American Southwest

Description. In the North American southwest, the presence of hundreds of stone towers that differ markedly in architecture from the structures usually built by North American Indians. In one specific region, the Gallina Valley, the skeletons inside the towers reveal that the its defenders were ruthlessly slaughtered in what seems to have been genocide.

Data Evaluation. All of our source material was authored by archeologists and anthropologists, although some of their writings appeared in popular publications. The latest sources in our files are about 30 years old and may have been superseded by more recent material we have not come across. Rating: 2.

Anomaly Evaluation. The towers are unique to North America and deserve catalog recognition for this alone. More anomalous, though, are: (1) the uncertain origin of the Gallina Valley tower builders; (2) the identity of their exterminators; and (3) the reason for the unusual ferocity of the attacks on the towers in that region. Even collectively, this ignorance challenges no important paradigms and is, therefore, only marginally anomalous. Rating: 3.

Possible Explanations. The towers were built in response to the intertribal warfare that persisted for centuries in the southwest, especially during the period of Anasazi dominance. The Gallina people were invaders from the Plains and for reasons unknown were special targets of neighboring cultures, possibly the Pueblos.

Similar and Related Phenomena. The use of the towers in the Hovenweep area for astronomical observations (MSA1).

Entries

X0. Introduction. Scattered over northern New Mexico, southwestern Colorado, and southeastern Utah are hundreds of incongruous "mystery" towers. These squarish, occasionally round, stone towers are not mysterious because of their size, their architecture, or even their incongruity, although they definitely do seem out of place in comparison to the usual teepees, hogans, and pueblos of the American West. The towers are often designated "mysterious" because we know so little about their builders. In particular, those towers in the Gallina Valley in northern New Mexico have puzzled anthropologists. The people who built the Gallina Valley towers seem to have been exterminated in a campaign marked by so much hatred and viciousness that we have to use the word "genocide." We don't know exactly who the Gallina people were, who slaughtered them, or why they did it.

The region containing the towers was dominated mainly by the Anasazi during the "time of troubles." It is inescapable that they were deeply involved.

First, though, a look at the tower phenomenon as a whole. It was wider than the Gallina Valley. The ruins of many hundreds of stone towers now exist in an area encompassing tens of thousands of square miles. They were apparently erected mostly for defense, for their builders seem to have been perpetually at war during the years from about 1100-1300 A.D. Since the tower builders were thinly dispersed over this poor land, they could not muster large armies and were often reduced to building many scattered "point defenses" against their foes rather than large, heavily manned forts. However, the point-defense tactic did not work for long in the Gallina Valley. According to the archeological evidence,

the towers there were methodically picked off one by one and their defenders ruthlessly murdered down to the last woman and child.

In the context of "ancient structures," which is the theme of this catalog volume, these "mystery" towers of the American southwest are unique in their sheer number and disposition over an immense area. In the context of anthropology, they proved the futility of point defense and, in the Gallina Valley, revealed the depth of hatred one people can feel towards another.

X1. Character and disposition of the towers. In a 1950 article in *American Antiquity*, A. Schulman divided the towers in the American southwest into five groups (see map):

- Mesa Verde area
- McElmo Canyon area
- Hovenweep area
- Navaho area
- Gallina area

The types of towers, their ostensible purposes, and even the cultures that built them vary. We are most interested in the Gallina area, for it is there that

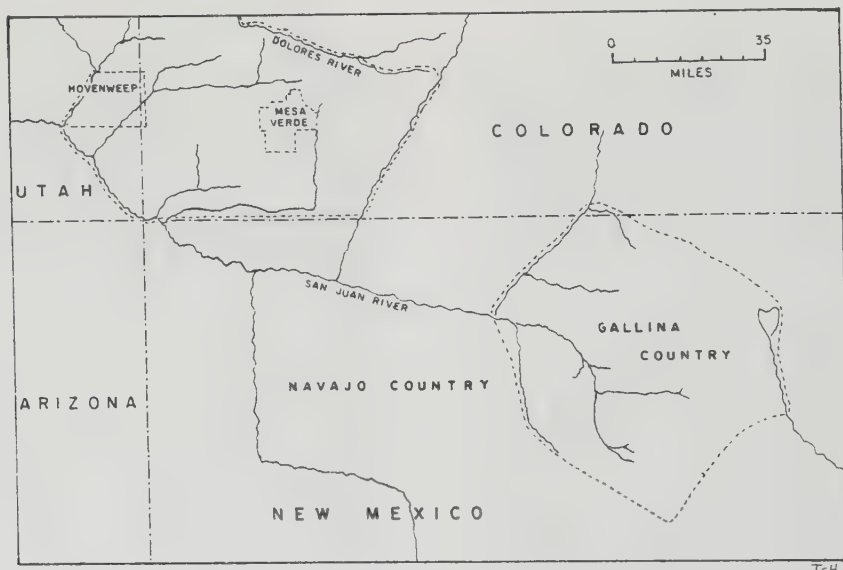
most of the mysteries seem to reside. But it is also important to view the total tower phenomenon in a brief overview.

Mesa Verde area. Most of the towers are placed on easily defended points. Usually two stories tall, the largest was about 25 feet in height. In this area, the towers were apparently a secondary type of defense, with the famous cliff houses constituting the main defensive bulwark. This region was more heavily populated than the Gallina Valley.

McElmo Canyon area. Towers here are located near pueblos and at the mouths of canyons. Basically, this area is an extension of the Mesa Verde area.

Hovenweep area. The beautifully preserved towers in this area are found on the tops of immense boulders, along mesa edges, and canyon rims. Other sorts of ruins, such as pit houses, are usually nearby. The Hovenweep towers were obviously sited and built for primary defense. Since they are the most elegant of all the southwestern towers, Schulman's description of them is of interest.

Forms. Circular, rectangular, or rectangular with rounded corners.



Pre-Columbian tower areas in the American Southwest.



*The square type of tower as seen in
Hovenweep National Monument, Utah.*

Size. Present height varies from 8 to 10 feet; thickness is 2 feet, and width varies from between 15 to 26 feet.

Construction. The towers are generally of better construction than the other buildings. Building material consists of sandstone blocks of irregular size and shape, fastened in place with mud and mortar. On the outside wall, these blocks are often smoothed. Walls are usually of two layers and average 2 feet in thickness. The towers are usually two-storied and may be surmounted by a parapet. They may be fitted with a number of slit windows.

Interior features. There are some multi-chamber rooms with walls the thickness of one stone. (R3)

Navaho area. All towers in this area seem to be post-Columbian and not relevant here.

Gallina area. About 500 towers are distributed over an area 35 by 50 miles in extent. Located along cliff and ridge precipices, the towers are also always near or attached to dwellings of some sort. These dual-purpose arrangements are sometimes called "torreones," the Spanish word for "towers."

The Gallina area seems to have been occupied by a different group of people from those in the other areas containing towers. While the whole of the southwest seems to have been wracked by strife in the 1100-1300 time period, the Gallina area was the focal point of the genocide mentioned in X0. In this regard, Schulman wrote:

This is a rugged, poorly watered, "refuge" country. The Gallina buildings are located and constructed virtually always with the idea of defense foremost. Towers play an important role in the location of other structures. In the absence of towers, the canyons often contain cliff-house defenses. Structures are invariably discovered burnt and ruined, artifacts are found to be wantonly destroyed, and bodies are uncovered within or around the ruins. (R3)

Since the major mystery of the southwestern towers concerns that strange campaign of extermination of the Gallina people, we need to know how their defensive towers were constructed. C.B. Gallenkamp has sketched a generic Gallina tower for us.

The building of towers in any form was not common among primitive peoples of North America, but here

[Gallina Valley] are found literally hundreds of them covering the area. They were constructed of crude blocks of sandstone held in place by adobe mortar, and they often exceeded 30 feet in height. This can be accurately determined by the volume of debris at the base. The walls were of double construction, reaching a thickness of six feet at the base. Usually the towers were square or somewhat rectangular in shape, but several round towers have recently been excavated. The towers were entered by means of two ladders made of lashed poles. One reached from the ground to the top of the structure outside. Another led from an opening in the roof down into the tower to the floor below. The outside ladder could be drawn up when the tower was under attack.

.....

The extent to which some Gallina families went to ensure defense was fantastic. Indeed, the efforts in this direction made by the tribe as a whole exceed anything else in the known history of the pre-Hispanic Southwest. (R4)

One can surmise that the towers first served as sentinel posts. When enemies were observed approaching, the occupants of the attached or nearby houses rushed to the towers to aid in its defense. This strategy was not unlike that used by early settlers in eastern North America, except there the forts were wooden and the population density higher.

X2. Genocide in the Gallina Valley. In 1933, a gold prospector named J. Areano returned from the desolate country along the Gallina River in northern New Mexico with a tale of many stone "torreones" or towers he had seen. Since stone towers were rarely built by North American Indians, Areano's story attracted the attention of anthropologist F.C. Hibben. Hibben quickly assembled and led an expedition into the virtually unmapped region. There were towers all right, hundreds of them. But the towers per se were not as remarkable as their contents.

Hibben and later scientists found that

every single tower in the valley had been attacked, and its its defenders annihilated---men, women, and children. Most towers were also burnt, perhaps during the assault but also possibly to erase as completely as possible the traces of a detested culture. The latter inference is quite reasonable, because each tower excavated showed signs of an almost maniacal assault. Skulls were split open. One woman warrior fell with sixteen arrows in her body. (R2)

Inhabitants of the Gallina Valley caught outside the towers fared no better.

In one pit house located on a ridge known as Rattlesnake Point, a pile of ten skeletons was unearthed. The victims had apparently been thrown into the pit together and fired upon at close range. The fingers and toes of several skeletons were roughly severed in a way that suggested torture before death. The bones were badly splintered by stones hurled down upon the writhing pile, and part of the flaming roof timbers had collapsed on top of them. (R4)

The vicious campaign of extermination lasted for about two centuries. If any of the Gallina people escaped, we have no record of them.

X3. The Gallina people and their slayers. The Gallina culture existed on the periphery of the territory dominated by the Pueblo people. Although the Gallina culture exhibits some Puebloan elements, there are strong indications that the Gallina people invaded northern New Mexico from the Plains to the north. F.C. Hibben expressed his views on their origin as follows:

It seems obvious that the Gallina people were not ordinary Pueblo Indians. The physical make-up of the skeletons in the towers was slightly different. Many of their utensils and weapons were radically different. For instance, their typical cooking pots with the pointed bottoms are absolutely un-Pueblo-like. The fact that they used elk antlers for axes and adzes is unlike the Pueblos. The very fact that they built stone

towers in itself distinguishes them from any of the Pueblo peoples that we now know. In one of the towers we found a handful of pieces of pottery of a type which is not indigenous to the Southwest at all. This is a variety of pottery known in Nebraska, and even farther to the east in the Mississippi Valley.

We also found that the inhabitants grew a kind of corn and varieties of pumpkins that were known to the early people in the vicinity of Iowa and the Missouri Valley. (R2)

Both A. Schulman (R3) and C.B. Gallenkamp (R4) echo Hibben's claim that the Gallinas differed from the Pueblos. According to Gallenkamp, the Gallinas were taller and leaner than the stocky Pueblos. This physical difference might have been resented by the Pueblo Indians, but was that enough for them to commit genocide?

Actually, the only solid clues we have as to the identity of the slayers of the Gallinas are the arrows found amid their bones. These arrows are undeniably Puebloan. But the Pueblo Indians were generally a peace-loving people. It is difficult to imagine them involved in cultural genocide. In fact, it is so unlikely that Gallenkamp suggests that the Gallinas had adopted the Pueblo-style arrows and used them upon themselves in a civil war of extermination. (R3) But cultural suicide is likewise hard to conceive.

In the end, we have to admit that

we have only a rough idea where the Gallina people came from and only guesses as to who assailed them with such vehemence and why.

X4. Archeoastronomy cross reference. Some of the towers in the southwest, notably those in the Hovenweep area, apparently served as astronomical observatories. See Chapter MSA. (R6)

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MST3

Chulpas: Stone Towers of South America

Description. Chulpas are stone towers common in the high Andes. They exist in various shapes: round, square, tall (often over 30 feet high), squat, etc. They were used as sepulchers.

Data Evaluation. Chulpas have been thoroughly studied by archeologists; they are mentioned, usually briefly, in most publications on South American archeology. Rating: 1.

Anomaly Evaluation. Some chulpas are remarkable for their fine stonemasonry, especially the later structures built by the Inca, where large, polygonal stones are precision-fit. See MSB4 for a fuller discussion of this potential anomaly. Rating: 1.

A minor curiosity seen in some chulpas is the presence of extremely small entrances.

Possible Explanations. See MSB4.

Similar and Related Phenomena. Puzzles of Inca stonemasonry (MSB4); precision stonework at Tiahuanaco (MSB5-X1) and in some megalithic walls (MSW3 in Ancient Infrastructure). Precision stonework in the Great Pyramid (MSP6-X2)

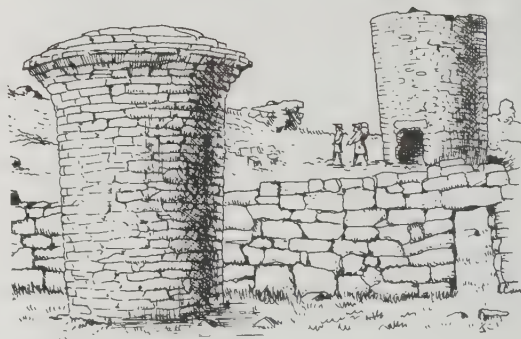
Entries

X1. General observations. Books that dwell on the archeology of South America are expansive about the buildings at Cuzco, the great mud-brick pyramids of Peru, and, of course, the massive stone "fortress" at Ollantaytambo; but they say little about the chulpas (or "chullpas"). The chulpas are the only towers of note in South America, and they merit mention for this, their size, and the excellent stonework manifest in some of them.

Chulpas are stone burial towers raised by early Andean cultures beginning about 1,000 AD and reaching their most sophisticated form under the Inca between 1,400 and 1,550 AD. While the earlier chulpas are merely igloo-like, rather crudely assembled, stone structures, some of those constructed by the Inca reach almost 40 feet in height and are representative of the best Incan stonemasonry in their use of precision-fit, polygonal stones.

A good description of the basic chulpa is found in The Andes, by E. Guidoni and R. Magni.

The chullpa is generally round in shape, occasionally square or rectangular. The most imposing ones have diameters of twelve to fifteen feet and attain heights of over thirty feet. The exterior walls of some are formed of standard-sized stones, smoothly rounded and accurately joined; others are of rougher stones, but neatly constructed. A band in relief, protruding a few inches, divides the vertical wall from the roof, which imitated the cupola of a vault---and



Round chulpas at the hill fortress of Quellenata. (R1)

was intended to symbolize the heavens. The roof was made of stone and mud of great thickness, and indeed the bulk of the chullpa was solid; it was really like a compact artificial tumulus, built over a small sepulchral cell. This burial chamber was entered through a tiny door---facing east, of course---and within were a number of niches; this inner chamber was also covered with its own pseudo-dome. (R6)

Many chulpa varieties exist, differing a bit from the generic description above. A few chulpas are doorless; others possess several doors and windows. G. Savoy reported a four-story chulpa in the Teaven Valley with windows at each level. (R4) Why burial vaults would require windows is an unanswered question.

A peculiar feature of many chulpas



Square chulpas at Acora. Note the precision-fit stone masonry. (R2)

is the very small size of their entrances. It is exceedingly hard for adult archeologists to squeeze through them. Some seem difficult even for children! (R3)

The sketches display several types of chulpa stonework from an irregular polygonal style to the best masonry Incan engineers could produce. As J. Hyslop observes below, the latter had to be major construction projects.

Of course, different kinds of chulpas were constructed in different ways. The earlier, smaller, igloo-shaped chulpas could have been constructed by a couple of men in a few days. On the other hand, the largest chulpas with Inca-style stonework must have taken large work crews months or years to complete. For example, the large 12-meter high, square chulpa at the Mallku Amaya burial area of Cutimbo is a major work of monumental architecture. Some of the base stones are nearly 2 m. in height while others near the roof are smaller but still weigh several tons. It appears that these larger structures were constructed by means of stone ramps. Chulpa blocks were hauled up the ramps and then, when the chulpa was completed, the ramp was removed. (R5)

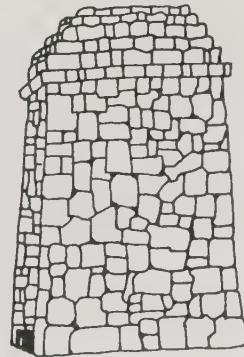
From the two foregoing quotations, we see two reasons for assigning space to chulpas in this volume of anomalies and curiosities:

(1) The best chulpas of Inca manufacture raise the perpetual question: How did the Inca stonemasons manage to fit large polygonal stone blocks together so tightly (MSB4); and

(2) The diminutive entrances to some chulpas are reminiscent of the miniature buildings with tiny doors observed at some Maya ruins (MSB2-X1) and, even more so, the curious one-foot-high tunnels at Monte Alban, Mexico. (MSE3-X2 in *Ancient Infrastructure*) Who, if anyone, used these tiny structures?

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A square chulpa with highly irregular (polygonal), but still neatly fit, stonework.

MST4 Ancient European Stone Towers: A Survey

Description. Five classes of large, rude stone towers present by the hundreds in Ireland and Scotland, and in the thousands on islands in the western Mediterranean. The Irish round towers are cemented, but the others are massive examples of dry-laid stone masonry. The Scottish brochs, in particular, may be the largest examples of such architecture in the world. Finally, a single, very curious, French stone tower is also cataloged here.

Data Evaluation. All of the towers cataloged here, except for the French "mystery tower," have been studied in depth and reported in the professional literature. The French tower information appeared in a science magazine. Our data evaluations are the first figures in the ratings below.

Anomaly Evaluation. In general, the towers described in this section presented no significant engineering problems to their builders, even though some are more than 3,000 years old. The stones employed were rather small and only roughly dressed. Mainly, the unanswered questions involve the purposes of the towers and the types of societies that built them. All five tower types do pose archeological and anthropological conundrums of some sort, as delineated below. Our anomaly evaluations are the second figures in the ratings.

- The purpose of the 100-plus Irish round towers is controversial. They do not seem suited for defense, belfries, watchtowers, or any other obvious application. (X1) Ratings: 1/2.

- The several hundred Scottish brochs were obviously defensive dwellings and refuges. The puzzle is: Why were they needed and concentrated on the islands of extreme northern Scotland? (X2) Ratings: 1/3.

- No one seems to know who built the French "mystery tower" and for what purpose. (X3) Ratings: 2/2.

- The 7,000 or so Sardinian nuraghi were defensive structures and refuges. However, there is a wide divergence of opinion about the character of the society that built them. (X4) Ratings: 1/3.

- Some of the talayots of the Balearic Islands, like the Sardinian nuraghi, were probably defensive structures, but others do not seem suited to that purpose. (X5) Ratings: 2/2.

Possible Explanations. It is difficult to frame generalities here. The great profusion of large, stone European towers in ancient times indicates that the cultures that erected them were in a state of continuous warfare with invaders and among themselves.

Similar and Related Phenomena. The stone towers of the North American southwest (MST2); all ancient forts (MSF), especially the Scottish "fused forts" (MSF3).

Entries

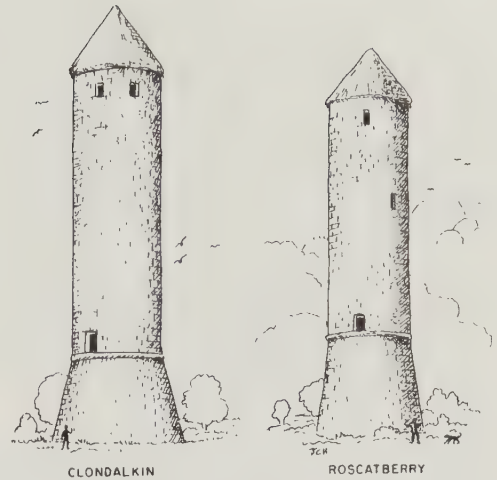
X1. The round towers of Ireland. Over 100 unusual stone towers, many more than 1,000 years old, are sprinkled about the landscape of Ireland. Before the great Irish earthquake of 448 A.D., there were still standing dozens more of these tall, severely cylindrical structures. Most Irish round towers exist in splendid isolation from the many other ancient Irish antiquities. Perhaps at some time in the distant past they were connected to churches or other buildings, but the latter are now rubble or, if made of wood, completely disintegrated.

The Irish round towers are also isolated architecturally. Except for two examples in nearby Scotland, at Brechin and Abernethy, they are unlike any of the other European towers, which are usually integrated into larger buildings and complexes. Nor is there an architectural trail across Europe to suggest where the style of the Irish towers originated. They seem to be an independent invention. (R1, R3)

The architecture of the Irish round towers was well described in 1887 by R.W. Gambier-Bousfield.

The characteristic of all these towers is the extreme simplicity, and viewed from a short distance, they may all be said to be alike. The principal and most conspicuous difference between them is that of height. The highest is believed to be that at Old Kileullen, which is 120' high. That at Kildare is 108' high, 54' in circumference at the top, and this one will serve as an example of the proportions of them all. They vary considerably in height. At Devenish is one only 82' high, at Kilkenny the tower is 100' high and 46' 6" in circumference at base. To describe the whole, or anything like the whole of over one hundred and twenty of these towers would be a long task and would become uninteresting. Those I have already mentioned and a few others I shall refer to, being sufficient for the purpose.

These towers, then, presenting in appearance great hollow pillars, are always circular on plan. They are usually built with rough stones, some very large, others very small, put together in the most haphazard manner just as they come to hand, and with thick joints filled up with



Two Irish round towers. Note the height of the door above the ground. (R3)

cement. As an exception to the rule, the tower at Ardmore is built in regular courses of beautiful ashlarwork, but this tower is an isolated peculiarity, quite different from all the others, and is among the most modern. As a rule, the walls rise without any projecting string or ornament from base to summit, diminishing in diameter as they ascend, and are capped with a conical roof of stone, resting on a slightly projecting cornice. They are hollow from top to bottom, though it is by no means improbable, but rather, highly possible, that they had floors and that these, being of wood, have decayed or been destroyed, and, no doubt, used for firewood. (R3)

Gambier-Bousfield goes on to remark on the scarcity of external openings in the towers. In particular, he notes that the doorways are not only very small but are located well above the ground level. Access was, therefore, made intentionally difficult, implying that the towers were probably not in constant use and perhaps defensive in purpose.

Most archeologists assert that the Irish round towers were built from the Fifth through the Thirteenth Centuries by early Irish Christians. Yet, the towers are almost devoid of Christian symbols or emblems. A minority of scholars favor the theory that pagans built

the towers for worshipping the sun and the moon, which would imply an origin prior to the Fifth Century. (R20)

The purpose(s) of the round towers is hard to ascertain, for we have only hollow cylinders of rough masonry to go on. The towers could have been belfries, forts, watch towers, retreats for monks, or even granaries. Their architectural style, though, is not very compatible with any of these applications. The small, elevated entrances seem to rule out any purpose requiring frequent traffic. In the end, we have to admit that we are not sure why these striking and unusual towers were built.

X2. The Scottish brochs. Scotland's brochs, like Ireland's round towers represent a unique style of architecture. Whereas the round towers are tall, thin, and strengthened with considerable cement, the brochs are squat, massive, and lacking in cement. The thick walls of the brochs consist of flattish stone

slabs piled atop one another. These walls have to be thick to stand by themselves. Most broch walls are double, with intervening galleries: total wall widths being 15-20 feet. That the brochs are not minor engineering structures is evident in the words of the Scottish scholar E.W. MacKie:

...brochs are among the most striking of all the prehistoric monuments of Europe. (R15)

Thus, MacKie classes the brochs with the great passage graves at Maes Howe and New Grange and even Stonehenge. (MSU2) In his book The Brochs of Scotland, MacKie lauds them further:

Apart from Stonehenge they appear to be the only really advanced creation of prehistoric and early historic times which was invented entirely within Britain, instead of being imported here from elsewhere. (as quoted in R12)

The Scottish brochs are in fact among



*Ruin of Dun Carloway broch on the Isle of Lewis.
The galleries between the double walls are exposed.
(Janet & Colin Bord/Fordean Picture Library)*

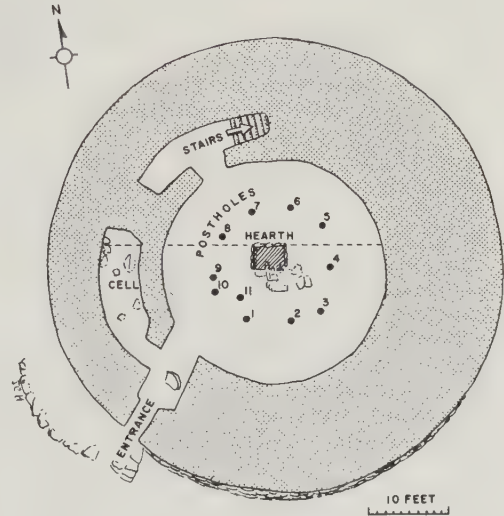
the largest examples of dry-laid stone masonry in the world.

In northern and western Scotland, archeologists count the remains of more than 500 brochs. These ponderous structures have survived the attacks of men and the elements since the Iron Age, circa 1,000 B.C. and early A.D. Unlike the Irish round towers, whose purpose remains cloudy, the brochs were clearly defensive works and places of refuge for the inhabitants of far northern Britain and their animals as well. One cannot resist comparing them to the towers of the North American southwest in their type of masonry and use in point defense.

For some details of broch construction, we go to A.O. Curle's 1927 paper in Antiquity as summarized in Nature.

In Antiquity for September [R9], Mr. Alexander O. Curle discusses the origin and structure of the broch---the characteristic defense structure of the north and west of Scotland, consisting of a circular tower surrounding an open court, built of dry masonry without mortar or other building material, and of which the height originally in some cases must have been as great as 60 feet. The [double] walls at the base are usually 15 feet thick and contain series of superimposed galleries. A puzzling feature, a ledge projecting about 12 inches from the interior of the wall, is now explained in the light of excavations at Dun Troddan, as the resting place for beams extending to posts circling the interior and forming the roof or a closed colonnade around a central hearth open to the sky. The brochs have no relation to the Nuraghi of Sardinia [X4], which differ from them essentially in structure and purpose. Their closest analogies are to be found in the galleries duns or promontory forts and the so-called 'semi-brochs' of the west of Scotland. The distribution of the brochs points to its origin in the north and west of Scotland, those found outside this area being due to an extension of tribal influence from the north. In date they are to be regarded as not earlier than the Iron Age, while the occurrence of Samian ware, Roman coins, and other objects, indicates that they were occupied at the time of the Roman invasion and in the

Second Century A.D., though probably they date back some hundreds of years before that time. They probably were occupied for some time later, but from the absence of wheel-made pottery and Viking relics, it cannot be asserted that they survived to the Eighth Century. (R7)



Horizontal section of Dun Troddan broch showing the galleries. (R7)

The "semi-broch" referred to above is a simpler structure. It duplicates the broch's double wall and open courtyard in the center, but the galleries between the double walls seem to have been confined to the ground level. Essentially, the semi-brochs are shortened versions of the full brochs. (R9)

The brochs are notable for their size and unique style of architecture. Despite the opinion expressed above by Curle, the brochs do resemble somewhat Sardinia's nuraghi. (X4)

The only aura of mystery surrounding them concerns their presence in the remote, inhospitable parts of northern Scotland, such as the Shetland Islands. D.H. Childress asks whether these fort-like structures were outposts guarding ancient sea lanes. (R20) But was important sea commerce plied the cold waters off northern Scotland 3,000 years ago?

X3. France's mystery tower. L.S. de Camp is well known for his antagonism toward pseudoscience and all those mysterious phenomena said to occur on the outer fringes of science. However, in his book The Ragged Edge of Science, he tells the tale of a strange stone tower that stands in the city of Nîmes in southern France. Amid the elegant buildings built there during the long Roman occupation is a tower he is quite happy to relegate to the realm of the unexplained.

The most enigmatic of these structures is a large tower atop a prominent hill, Mont Cavalier, at the northwestern edge of the city. It is called Tour Magne, from *turris magna* or "great tower." Now 92 feet tall, it formerly rose over 30 feet higher but has suffered dilapidation over the centuries. The upper platform, reached by a spiral stair inside, still affords a magnificent view of Nîmes and the surrounding countryside. No ancient writing or inscription sheds light on who built this tower or why. (R14)

Overall, de Camp states, the tower reminds one of a lighthouse, but it lies 30 miles from the sea. Its style of architecture suggests that it was raised during the first century B.C. This rough date and the scanty information provided about the tower's configuration correlate well with the facts of the Irish round towers, but Ireland is too far away to claim cultural diffusion.

X4. The nuraghi of Sardinia. Nuraghi are round, thick-walled towers of dry-laid stones dotting the Mediterranean island of Sardinia in great profusion. In 1872, J. Fergusson wrote that there might be as many as 3,000 of these ancient towers on Sardinia. (R1) After more than 130 years of searching, archeologists now estimate that there are more than 7,000! (R19) Although a small handful of look-alikes are said to exist in Italy (R5) and on the Balearic Islands to the west (X5), the nuraghi are essentially unique to Sardinia.

The nuraghi are not anomalous because of their style of architecture nor for their large numbers, although 7,000 structures are remarkable for an island

only 160 by 80 miles in extent. Of course, we must ask: Why so many? Why are they often isolated but then sometimes clumped closely together? Are they fortresses, dwellings, tombs, temples, or something else?

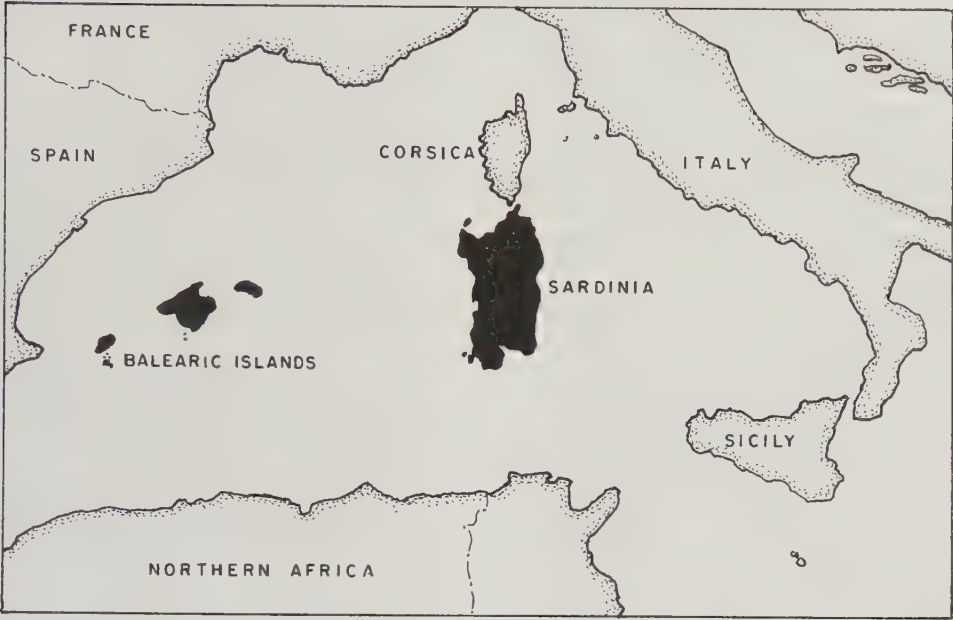
The nuraghi, it turns out, are the major surviving traces of a culture that still perplexes anthropologists. There are many confident statements in the literature asserting the true nature of the society that built the nuraghi (R16, R17, R19), but these statements turn out to be conflicting. This is where the nuraghi may be important and modestly anomalous. They may be the key to obtaining a scientific understanding of the Bronze Age people who carefully piled tens of millions of large stones into massive towers that contain not only rooms but also a strange assortment of blind tunnels, stone trapdoors, peepholes, and curious niches. The nuraghi seem to indicate some sort of paranoia of their builders. Basically, we do not completely understand the nuraghi-builder society; and learned opinions differ sharply on this matter.

Like most of the Mediterranean islands, Sardinia has seen its share of invaders. The first settlers arrived about 13,000 B.C. or earlier. We know the Phoenicians anchored there circa 1,000 B.C. Carthaginians arrived about 600 B.C. And, of course, the Romans could not resist occupying this nearby island in 238 B.C. (R17)

When the Phoenicians made landfall, the nuraghi were already in place and ancient; the first of them having been constructed about 2,200 B.C. (R17) The towers that the Phoenicians found are quite remarkable. Modern archeologists do agree on this. After they chased the bats, cows, and pigs from these crumbling structures, archeologists discovered that many of the nuraghi are not simple stand-alone towers but internally sophisticated units of larger structural complexes.

However, when J. Fergusson compiled his masterful survey of rude stone monuments in 1872, the wider dimensions of the nuraghi phenomenon were not fully appreciated. He wrote:

A Nurrag [spellings vary] is easily recognized and described. It is always a round tower, with sides sloping at an angle of about 10 degrees to the horizon, its dimensions varying

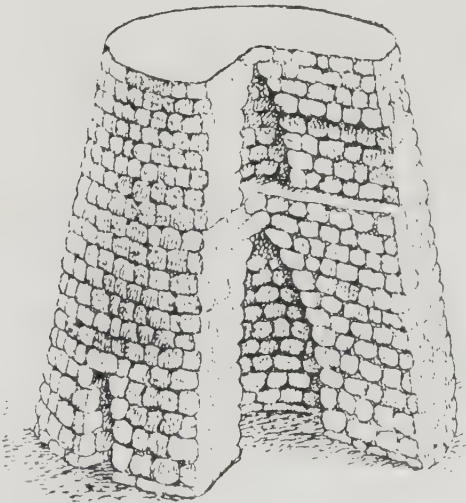


*The Balearic Islands are home to the talayots.
Most of the nuraghe are sited on Sardinia.*

from 20 to 60 feet in diameter, and its height being generally equal to the width of the base. Sometimes they are one, frequently two and even three storeys in height, the centre being always occupied by circular chambers, constructed by projecting stones forming a dome with the section of a pointed arch. The chamber generally occupies one-third of the diameter, the thickness of the walls forming the remaining two-thirds. There is invariably a ramp or staircase leading up to the platform at the top of the tower...

When the Nurhags are of more than one story in height, they are generally surrounded by others which are attached to them by platforms, often of considerable extent. (R1)

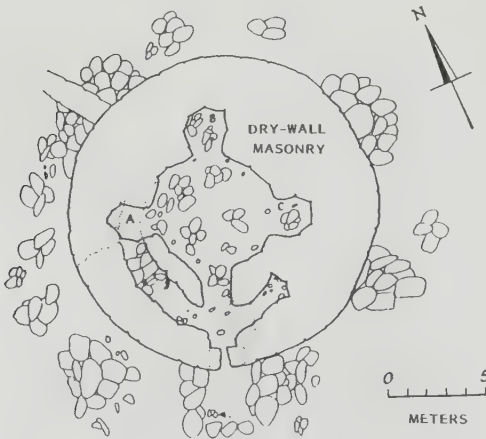
A present-day structural engineer would describe a nuraghe (the singular form of "nuraghi") as an example of dry-stone, cyclopean masonry. The basic building material was basalt, which is common on Sardinia. Coarse-grained, polygonal boulders of basalt were piled together with little or no dressing and no mortar. This is not a very sophisti-



*Cutaway view of the internal structure
of a nuraghe. (R10)*

cated form of construction, but the boulders involved were large---the biggest measuring about a meter in each dimension. The average boulder was much smaller: about 50 x 50 x 75 centimeters, weighing only about a ton---far less than many stones used in megalithic structures in western Europe. With the use of ramps and log rollers, the construction of the nuraghi posed no real engineering problems for a Bronze Age society. (R19)

The puzzle posed by the nuraghi is not one of engineering but rather belongs to anthropology. In the latter paragraph of the above quotation from Fergusson we detect a hint that the nuraghi may sometimes be elements in a hierarchy of more-complex structures. A single nuraghe could well have been associated with a family, a larger group of nuraghi with a clan, and a still larger group with a village. In fact, G. Lilliu calls the nuraghi "proto-castles"---each nuraghi potentially a castle turret. (R10) The nuraghi, therefore, may be lithic mirrors of the unfolding of Sardinia's ancient social structure.



Horizontal section of the Nuraghe Toscono-Boroe. (R19) It is rather similar to that of a Scottish broch!

In this view, the single nuraghi were built by single families as a combination dwelling and fort, again much like the towers of the American southwest. And, as Sardinia's population grew, families

banded together in clans, and nuraghi were likewise joined by ramps, walls, and other structures.

The evolution of the society that built the nuraghi, like the nuraghi themselves, became more and more complex, sophisticated, and stratified, as chronicled by M.S. Balmuth.

Gradually clusters of nuraghi were established: subsidiary towers were added to the central one and connecting protective outer walls were built between them. The most complex of these became functioning villages containing specialized workshops. Members of a slave or lower class were probably directed in the laborious construction by someone in authority who doubtless was responsible for the homogeneous design of structures, reflecting some degree of social stratification. (R16)

Today, many anthropologists concur that nuraghe society was politically centralized, complex, and high stratified, just as Balmuth theorized. But G.S. Webster demurs. He made what might be called a "time-and-motion" study of nuraghe construction and was convinced that the prevailing view went too far in the direction of social complexity. He wrote:

I rather conclude that nuraghi were built over some 600 years through the modest communal efforts of non-specialized groups of tribesmen, loosely organized by headmen and/or petty chiefs. (R19)

This alternate interpretation of the anthropological significance of the nuraghi sharply challenges the prevailing picture of a highly organized, highly stratified society. There exists, therefore, a modest anthropological anomaly.

To answer the questions asked at the beginning of this section, the nuraghi were dual-purpose structures: forts and dwellings. There is no evidence that they were ever tombs or temples. There is, though, ample evidence that the nuraghi builders were frequently engaged in interclan warfare and the repelling of invaders. In this, the nuraghi resembled the Scottish brochs. (X2) As a matter of fact, the architectural styles of the nuraghi and brochs are not all that different.

X5. The talayots of the Menorca and Mallorca. The Balearic Islands are positioned off the east coast of Spain. The two largest of the group, Menorca (or Minorca) and Mallorca (or Majorca) boast a class of stone towers called "talayots." Talayot means "watchtower," but these dry-laid stone structures were more likely defensive dwellings like the nuraghi on Sardinia (X4), which they resemble in many respects.

Early settlers set foot on Menorca and Mallorca about 5,000 B.C. Talayot building did not commence until circa 1,500 B.C. It continued for about 1,000 years. Archeologists and anthropologists believe that the talayots were constructed by a wave of immigrants, very likely nuraghi-builders from the larger island of Sardinia to the east of the Balearics. Both Menorca and Mallorca support over 100 talayots each. They are also host to a variety of other unusual stone structures. For example, there are the "navetas," which are stone tombs shaped like inverted boats. There are also striking bilitheons called "taulas." Taulas consist of a large standing stone capped by a cross bar or lintel resulting in a T-shaped monument. Taula is translated as "table," but some are 13 feet high and obviously not suitable as tables. They may instead have had some religious significance.

Menorca, in fact, is the site of an impressive ritual complex named Talati. At Talati one finds not only a talayot

and taula but stone circles and standing stones---all reminiscent of some of the megalithic ritual centers in France to the north.

A fine and rather charming description of Menorca's surprising store of antiquities was penned by H. Sanz in 1886. He provides interesting background as well as an adequate description of the talayots.

In spite of the destroying hand of time, there are still to be found in Minorca (Balearic Isles) several megalithic monuments of past ages scattered all over the eastern part of the island, which by the rudeness of their construction show themselves to be the work of the early inhabitants. Even today the enormous heaps of stone called talayots cause great astonishment; the great stone tables, the artificial caves or cellars, rows of pillars and circles of menhirs, and those strange constructions in the form of a ship, the only ones in the world. It would be a most difficult task to suggest a creditable account of their origin wrapped as is the problem in the obscurity of history, difficult, if not impossible to solve.

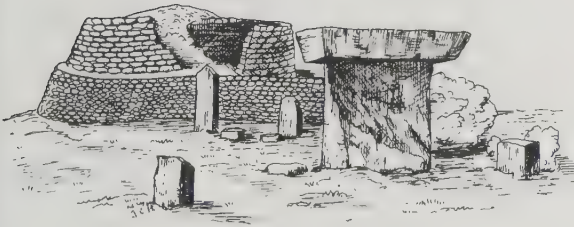
.....

Talayots are megalithic monuments in the form of a truncated cone whose base is circular, elliptic or oval, and a few like a quadrangular truncated pyramid, formed by a greater or lesser number of rows of great stones mostly unhewn and with no union whatever [i.e., no mortar].

.....

One of the most perfect and most characteristic types of talayots with the low entrance is situated in the estate of Nornia, the diameter of which is approximately 15 meters and not less than 11 meters in height. The low entrance or inferior door measures 0.80 m. in height and 0.60 m. in width. Within them are 10 or 12 steps, a stairway which once undoubtedly led to the upper part of the talayot, but the roof has fallen in and filled up the space entirely. (R2)

The talayots are thus seen to be only about half the height of the nuraghi of Sardinia. But are they really only smaller versions of the nuraghi? A 1927



A talayot at Trepuco, on Menorca. The puzzling T-shaped structure in the foreground is a "taula." (R6)

note in Nature denies this generic relationship and thereby challenges the prevailing theory of talayot origin and purpose.

It has generally been held that the talayots of Minorca, great mounds of huge, rough uncemented stones 26 ft.-30 ft. high, were comparable with the better known nurhags of Sardinia. This comparison was based on the view that the talayot in some, if not all, cases was built hollow with an entrance, resembling in this respect a chambered cairn. Mr. Chamberlin examined 186 talayots, some previously unknown. Of these, 107 were in a sufficiently good state of preservation to permit him to say that 32 only, or one out of three, had ever had an entrance of any sort, while three alone had an interior chamber, and only one more than one apartment. It is clear, therefore, that the talayot is not comparable to the nurhag and, indeed, is a monument without parallel. (R6)

Of course, archeological research since 1927 may have altered the statistics just presented.

Apparently, at least some of the talayots were defensive dwellings but others may have been built for other purposes. Perhaps some were simply intended to be tower-shaped monuments, like obelisks or church spires. We lack the later sources that might straighten this matter out.

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MST5 Ancient Towers of the Middle East

Description. Two examples of extremely ancient stone towers from Jordan, plus the Biblical Tower of Babel from Iraq. The latter, however, is really one of the so-called "ziggurats" and differs substantially in architectural style from the other towers that dominate this chapter.

Data Evaluation. Our references for Jordan's stone towers provide virtually nothing of an engineering nature. The Tower of Babel, in contrast, was described in some detail in travelers' reports from the Nineteenth Century. The data evaluations are the first figures in the ratings that follow.

Anomaly Evaluation. Each of the three towers cataloged here poses a different sort of puzzle to archeologists and anthropologists, as indicated below. The second figures in the ratings below give our anomaly evaluations,

●Jordan's Tower of Moab suggests the unlikely long-distance diffusion of architectural style from the Balearic Islands to the Middle East. (X1) Ratings: 2/2.

●Jericho's stone tower may well be the oldest tower on the planet. (X2) Ratings: 2/3.

●The Tower of Babel provides still one more example of ancient ruins that exhibit curious vitrification of refractory materials. (X3) Ratings: 1/2.

Similar and Related Phenomena. The talayots of the Balearic Islands (MST4-X5); the fused forts of Scotland (MSF3); ziggurats.

Entries

X0. Introduction. Stone towers do not seem to have been a favored form of architecture in the Middle East. So far, we have found only three examples worth mentioning, and one of these, the Tower of Babel, is more of a pyramid than a tower.

of the town. They consist of two dolmens, two round towers and innumerable walls or banks of stones. On seeing the round towers we were at once struck by their very close resemblance to the talayots of Majorca [Mallorca].

.....

X1. Jordan: the Towers of Moab. Details are lacking in the following account, but the comparisons to the nuraghi of Sardinia and talayots of the Balearic Islands (MST4) are actually more significant than the dimensions of the towers. An anonymous traveler wrote the following about these structures.

In these towers and dolmens, with their far-flung resemblances, we have yet another suggestion of remote cultural community extending over large regions of the ancient world. A direct connexion between, say, Majorca and Moab is of course very unlikely; but some ancestral community of culture there must surely be. (R3)

While staying recently at Amman, the capital of Transjordan, we were taken by our host, Group Captain Rees, V.C., to see some megalithic remains on the plateau lying to the southwest

X2. Jordan: Jericho. Some 30 miles east of Amman and the Towers of Moab lie

the ruins of Jericho. P. James and N. Thorpe assert that the ruins here are probably the oldest in the world, dating from about 7,000 B.C. The remains of tower that they describe may, therefore, be those of the planet's oldest stone tower.

At the center was a masterpiece of prehistoric construction---a solidly built stone tower, enclosing a spiral central stairway, the lower thirty feet of which were still standing when Jericho was excavated by a team of British archaeologists in the 1950s. Kathleen Kenyon, director of the excavation, clearly stood in awe of this discovery: "The whole comprises an amazing bit of architecture." The staggeringly early date of these constructions is underlined by the fact that they were built at Jericho even before pottery came into use there. (R4)

We must presume that the tower near Amman and at Jericho were both defensive in purpose, but we cannot be sure.

X3. Iraq: The Tower of Babel. The Bible's Tower of Babel was situated near Babylon, the ancient city some 55 miles south of modern Baghdad. Although this structure was called a "tower," it was really more of a pyramid with tiers and sloping sides. These unique structures are termed "ziggurats," and several others similar to the Tower of Babel were constructed in ancient Mesopotamia. However, since the Tower of Babel is widely advertised as a tower, we catalog this Biblical structure here.

Structurally, the Tower of Babel was quite unlike the other towers mentioned in this chapter. Rather than native stones, fired bricks were employed. In addition, the ziggurats had square bases and were built in tiers. The potentially anomalous feature of the Tower of Babel is the abundant evidence that some sort of catastrophic incendiary event caused its destruction. As the observations quoted below will amply demonstrate.

First, though, the historical perspective, as related in the Bible: When the descendants of Noah reached Mesopotamia, they began to build a tower that would reach up to heaven. Jehovah,

however, thought this to be presumptuous and thwarted their plan by confusing the language of the builders and dispersing them over the face of the earth. (Genesis 11) Thus arose the world's present-day profusion of languages and the origin of the English word "babble."

Next, a description of the Tower of Babel as written in 1839,

This is an immense pile of ruins,--- at its base it measures 3082 feet (in circuit,) width 450 feet; it presents two stages of hills; the first about 60 feet high, cloven into a deep ravine by the rain, and intersected by the furrows of ages. To the base of the second ascent is about 200 feet from the bottom of the entire pile, and from the base of this ruin to the top is 35 feet. On the western side, the entire mass rises at once from the plain in one stupendous though irregular pyramidal hill, broken in the slopes of its sweeping acclivities by time and violence. The south and north fronts are particularly abrupt towards the point of the brick ruin; on the north side there are large piles of ruins of fine and solid brickwork, projecting from the immense masses of rubbish at the base; the fine bricks were evidently part of the facing of this side. The tower-like ruin of the extreme summit is a solid mass 28 feet broad, made of the most beautiful brick masonry, and presenting the apparent angle of some structure originally of a square shape, the remains of which stand on the east to a height of 35 feet. It is rent from the top to nearly half way down; the remains of the masonry are furnace-burnt bricks: they are united by a calcareous cement about $\frac{1}{4}$ of an inch in thickness, having in it a layer of straw, and so hard that it could not be separated. The base of the structure was not altered, but the piles of fine bricks thrown down were vitrified with the various colors, and they gave the ringing sound belonging to the vitrifications of glass in the manufactories; the lines of cement are visible and distinct, and are vitrified. The consuming power appears to have acted from above, and the scattered ruins fell from a higher point than the summit of the present standing fragment.

The heat of the fire which produced such amazing effects, must have burned with the force of the strongest furnace; and from the general appearance of the cleft in the wall of these vitrified masses, I should be inclined to attribute the catastrophe to lightning from heaven. Ruins, by the explosion of any combustible matter, would have exhibited very different appearances. (R1)

Here follow two comments from other travelers who visited the ruins of the Tower of Babylon in times past. They were all greatly impressed by the evidence of extreme heat.

"At the foot of this tower-like lie great boulders of vitrified brickwork, which were evidently fused by fire, from heaven or elsewhere, and hurled from the original summit of the building, which was no doubt 100 ft. or 150 ft. higher. The appearance of these masses of fused brickwork very naturally led Jews and Mussulmans to conclude that they had been blasted by lightning at the time of the confusion of tongues, which put a stop to the building of the Tower of Babel by the impious descendants of Noah." ---Geary's Through Asiatic Turkey. (as quoted in R2)

"The most curious of the fragments are several misshapen masses of brickwork, quite black...These have certainly been subjected to some fierce heat, as they are completely

molten, a strong presumption that fire was used in the destruction of the tower, which in parts resembles what the Scriptures prophesied it should become---a burnt mountain. In the denunciations respecting Babylon, fire is particularly mentioned as an agent against it."---Keppel's Personal Narrative. (as quoted in R2)

Lightning can be an impressive vitrifying agent, but usually this action is limited to small areas on exposed rocks and so-called "fulgerites," which are relatively small, branching, vitrified masses of fused sand. But what other natural phenomenon could have produced the observed vitrification?

This sort of vitrification has been observed in several ancient structures, such as Scotland's "fused forts." (MSF3)

References

- R1. Anonymous; "Tower of Babel," American Journal of Science, 1:37:352, 1839. (X3)
- R2. Anonymous; "What Different Authors Say Concerning Birs Nimroud or Tower of Babel," Victoria Institute, Journal of the Transactions, 14:220, 1880. (X3)
- R3. Anonymous; "The Round Towers of Moab," Antiquity, 3:342, 1929. (X1)
- R4. James, Peter, and Thorpe, Nick; Ancient Inventions, New York, 1994, p. 200. (X2)

MST6

The Towers of Easter Island

Description. Two distinctive types of stone towers on Easter Island; one chambered, the other solid.

Data Evaluation. The Easter Island towers are rarely mentioned in the professional archeological journals. Our primary sources are two respected books in which the Easter Island towers are mentioned briefly. Rating: 2.

Anomaly Evaluation. Modest in size and simple in design, neither type of Easter Island tower is unusual from an engineering standpoint. Their purposes seem to be well-established and on the mundane side. The only reason for cataloging them is because they are neglected, unexpected, and apparently unique to Polynesia. Rating: 4.

Similar and Related Phenomena. Many of the stone towers described earlier in this chapter are similar in design to those of Easter Island, and some of these were also employed as watchtowers.

Entries

X1. General observations. Easter Island photographs and TV documentaries inevitably and quite understandably favor the great stone statues. So highly focused is this attention that most people do not even know that there are also stone towers on this isolated speck of Oceania.

In fact, there are two types of stone towers on Easter Island. The first is a modest masonry structure about 20 feet high possessing corbelled internal chambers. Sometimes dwellings are attached to this type of tower. The primary purpose of these towers was to watch for turtles and schools of fish. (R1, R2)

In his 1924 book The Riddle of the Pacific, J.M. Brown mentions the second type of tower. This is a solid structure apparently built specifically for hanging "navel strings"; that is, umbilical cords. This seems a strange activity to us but among the Polynesians, the cutting and disposal of a baby's navel string was an important ceremony. Brown explained further:

In the Hawaiian group, the navel-string of the child is taken secretly by the parent and plugged into a hole he has made in the face of a precipitous rock, and no one but himself knows the hiding-place. On Easter Island there was not the same secrecy; but safety was the first consideration; the navel string was placed in a gourd and hung or set on the top of one of those solid towers that have formed another of the mysteries of Easter Island. There are two types of circular and high stone erections; one has an entrance and room below, evidently for the

accommodation of a watcher when he needed shelter; this is the ana- or hare-honu, the turtle cave or house, intended primarily to be by the shelly beach on Anakena Bay or that on La Perouse, to watch for the rare visit of the turtle when it came to place its eggs in the sand, but later built in other places to observe the approach of the shoals of small fish like the nua or the ature, that was so necessary as bait for the bigger deep-sea fish. The other type of tower, found not only by the sea but inland, is called pipi hereko, and was built solid and high for the sole purpose of keeping the navel-strings out of the reach of meddling fingers. (R1)

In sum, the presence of towers on Easter Island may be unexpected but hardly anomalous.

References

- R1. Brown, John Macmillan; The Riddle of the Pacific, Stelle, 1996, p. 112. Reprint of the 1924 edition. (X1)
- R2. Bellwood, Peter; Man's Conquest of the Pacific, New York, 1979, p. 373. (X1)
- R3. Yoshida, Nobuhiro; "The Prehistoric Towers of Japan and Easter Island," Ancient American, p. 28, no. 31, 2000. (X1)



An ancient Easter Island house surmounted by a tower used for watching for turtles and schools of fish offshore.

MSU ANOMALOUS STONE CHAMBERS AND PASSAGE GRAVES

Key to Phenomena

MSU0	Introduction
MSU1	The Stone Chambers of Northeastern North America
MSU2	Remarkable Passage Graves
MSU3	Remarkable Acoustical Properties of Neolithic Passage Graves

MSU0 Introduction

Stone chambers and passage graves are basically very simple structures. They are constructed mainly of unworked stones piled on top of one another without the benefit of mortar to form crude passageways and chambers. Often these structures are covered with earth or stones or built into hillsides. Despite their apparent lack of sophistication, these crude structures pose some serious archeological and anthropological questions. In this chapter, we take three of these questions one at a time.

- By whom and for what purposes were the hundreds of stone chambers found in northeastern North America built?
- What was the significance of the unusual geometries, orientations, astronomical alignments, and enigmatic stone carvings associated with many of the Neolithic passage graves of western Europe?
- Did the builders of the Neolithic passage graves deliberately engineer them to enhance the production of acoustical standing waves and Helmholtz resonances?

MSU1

The Stone Chambers of Northeastern North America

Description. The concentration in New England and New York of hundreds of rude, dry-stone chambers of indeterminate age. Most are rather small and built into hillsides or covered with earth. Certainly some were and still are used as root cellars, but a few others are quite large for that purpose. Still others have significant astronomical orientations.

Data evaluation. The sizes, locations, and construction details of the northeastern stone chambers have been published in a wide range of professional and amateur archeological periodicals and books. Notably missing are artifacts and consistent radiocarbon dates that would support the precolonial, European origins claimed by some researchers. Rating: 3.

Anomaly Evaluation. Mainstream archeologists are adamant that all of the disputed stone chambers must be of colonial or more recent origin and, therefore, non-anomalous. This strongly held opinion is the "root-cellar" paradigm. This paradigm is challenged by the large sizes of a handful of these chambers, a few astronomical alignments, the incorporation of some into apparent megalithic complexes, associations with supposedly ancient inscriptions, and the strong resemblance of most to ancient European stone chambers. Given the vociferous debate that has transpired over these chambers between the professionals and amateurs, a few of these chambers must be considered highly anomalous, because they run counter to the strong assertions of the professionals. Rating: 1.

Possible Explanations. Most of the northeastern chambers are probably old root cellars, but a very few, such as those at Upton, Massachusetts and Gungywamp, Connecticut, "may" be precolonial and of anomalous provenance.

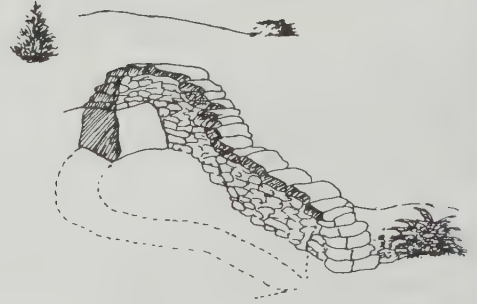
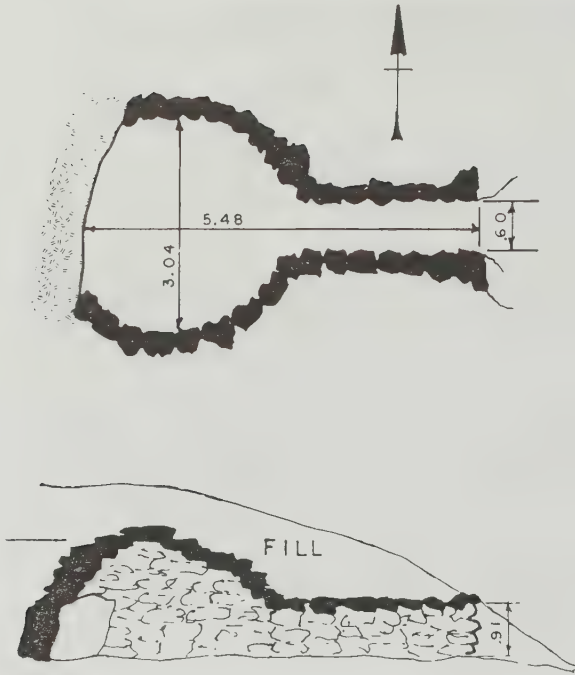
Similar and Related Phenomena. The Newport Tower (MST1); North American complexes of old lithic structures (MSS); dolmen-like structures in New England and New York (MSD4 in Ancient Infrastructure); anomalous New England shafts and tunnels (MSE5 in Ancient Infrastructure); ogam and other controversial inscriptions in the New World (MSW in another volume).

Entries

X0. Background. On February 1, 1876, readers of the Boston Journal were intrigued by the discovery of a curious underground "cell." The location was near Dedham, south of Boston, near the Charles River. The inhabitants of this area had long been aware of a number of symmetrical mounds in the area, which they had always supposed were artificial. The Journal article continued:

On the side of a bare hill, opposite one of the mounds and some two hundred feet from the river bank, some workmen have recently been engaged in excavating for a race course. On Thursday last, while grading for that purpose, their progress was stopped by a peculiar stone, which seems to be a kind of tufa, but is certainly

not identical with any rock formation near the spot. This rock, although some three feet in diameter, was so light as to be easily lifted by one man; and on rolling it aside a regular archway was discovered, leading horizontally into the hillside. The mouth of the arch was Roman shape, some two feet high by three broad; the walls and floor were evenly and carefully built of unhewn stone, cemented with a species of mud plaster, no lime cement having been found in the whole structure. The passageway widened, until, after some ten feet in length, it expanded into a wide cell some ten feet in diameter; one wall of this was artificial, the back of natural rock, and the other side also artificial, but of irregular shape. The cell was



The Dedham, Massachusetts, stone chamber was built into a bank. Dimensions in meters. The entrance is inconveniently small for frequent access. (Adapted from R16)

some five feet high and carefully floored throughout. (R16)

The newspaper's notice of the Dedham stone chamber is the earliest we have come across relating to the "northeastern stone chamber mystery." We do not know what eventually happened to the Dedham chamber, but it is far from an isolated example of a widespread, controversial phenomenon. In New England and New York, hundreds of similar, very old, stone chambers are built into hillsides and perched on high ridges. Most are somewhat smaller than the Dedham chamber; and most were doubtless constructed by early colonists for the storage of root crops and other mundane purposes. Actually, some stone chambers, resembling that at Dedham, are still used for vegetable storage.

Despite this ready explanation for the the existence of large numbers of old stone chambers, some investigators, mostly amateur archeologists, are firmly convinced that at least some this region's chambers are not colonial and were not root cellars. As we shall see, some of their arguments are interesting, plausible, and marginally persuasive.

Probably the main reason for being

skeptical about the root-cellar paradigm is the close similarity of these chambers to stone structures in Europe built long before Columbus set sail. Perhaps, the paradigm doubters say, some of the New World look-alike chambers were actually constructed by Precolumbian voyagers from Europe.

Who were these early crossers of the Atlantic? In avant-garde or "fringe" archeology, the Vikings are of course mentioned first, but there are also speculations about those adventuresome Celts, and even some intrepid Irish monks, who some claim made landfall in the northeast long before the Norse settlement at Anse aux Meadows in Newfoundland. Once again in this series of catalogs, we encounter the those diffusionists who hold that the oceans have been thoroughfares for several millennia!

However, chamber similarity alone hardly proves ancient trans-Atlantic crossings any more than the similarity of Mayan pyramids to those of Southeast Asia proves that the earliest colonists of Mexico and Central America had sailed across the Pacific. The opponents of early cultural diffusion are quick to point out that both stone chambers and pyramids are structurally simple and



*One of New England's controversial stone chambers.
This one is located near Putney, Vermont.*

easy to "invent." Indigenous peoples in the New World, they assert, required no help from the Old World in such elementary matters.

Cultural diffusion across both the Atlantic and Pacific has long been anathema to mainstream archeology and anthropology. It was very easy and also politically correct to write off all those rude stone chambers in northeastern North America as mere colonial root cellars, which of course many were and a few still are.

It wasn't until the 1960s that claims to the contrary became so vociferous as to require some sort of professional response. It was also during this decade that amateur archeologists began to organize and publish their off-mainstream journals. The New England Antiquities Research Association (NEARA) and the Early Sites Research Society (ESRS) took form and vigorously championed the claim that at least some of the stone chambers in the northeast were precolonial. Popular science magazines, such as Science Digest and Popular Archaeology raised public interest by calling the chambers

"clochans" after their European look-alikes and wondering about early American "cavemen". (R1, R3) It was apparent that some professional attention was required.

Professional archeologists had paid very little attention to the northeastern stone chambers until G. Neudorfer was appointed the first Vermont State Archeologist in 1976. Her careful study of Vermont's many stone chambers did much to reinforce the root-cellar paradigm that most professionals subscribed to and still do. Her analysis has been echoed ever since by the debunkers of the stone chambers and critics of "fringe" archeology.

Neudorfer's preliminary results were presented at an "Ancient Vermont" conference held at Castleton State College, Castleton, Vermont, in October 1977. This meeting with its professional mien was organized by W.L. Cook, a professor at the college with a longtime interest in the region's stone chambers and anomalous inscriptions. (R5)

The results of Neudorfer's completed study were published in the journal

Vermont History (R11) and later expanded into her book Vermont's Stone Chambers (R14), from which we now quote a portion of her conclusions.

The interpretation of those chambers for which there is not direct conclusive evidence must rest on the examination of their relationship to cultural traditions. The written record clearly shows that banked architecture, so common in the construction of cellars, was a widespread and persistent American tradition. The record also documents that hillside cellars structurally identical to the bank form of chamber were a preferred form of storage facility for roots in an era of pervasive root cultivation. The written record and field observations demonstrate a strong nineteenth century concern with proper solar orientation of the hillside cellars and other structures. The evidence confirms the availability of appropriate stone working technologies. The historic record, thus, conclusively refutes many of the arguments presented by the ancient theory proponents that the chambers could not derive from the historic period. The historic record also corroborates the oral tradition. The careful examination of each chamber further demonstrates that their structural attributes are consistent with their documented counterparts. Three lines of evidence---historic documentation, oral tradition, and primary data---all converge on the same interpretation. Based on the evidence, it is proper to conclude that most of Vermont's stone chambers were built as root cellars in the nineteenth century with some possibly as early as the late eighteenth century. The evidence also confirms that not all the chambers were root cellars; some were built for other purposes such as chimney supports. (R14)

Also attending the "Ancient Vermont" conference was A. Ross, from the Department of Archaeology, University of Southampton. Ross, an authority on ogam and other ancient inscriptions, brought to the discussions first-hand knowledge of European stone chambers. Ross spoke only briefly at the conference. Her opinions about the northeastern stone chambers and the associated epigraphy are best found in her paper

published (with P. Reynolds) in Anti-quity in 1978.

Our own conclusion, shared by our colleagues in these disciplines, is that the 'evidence' for Celtic settlements and writings in America BC as it has been presented to date is totally negative. (R6)

Together, Neudorfer's work and the assessment of Ross and Reynolds present a powerful defense of the root-cellar paradigm. Debunkers of the amateurs' claims of a precolonial provenance for the stone chambers inevitably draw upon them. (R13, R25) In consequence, mainstream science once again lost interest in the stone chambers. From 1980 on, essentially all investigations of the stone chambers have been conducted by uncredentialed amateurs, and who were, as might be expected, generally ignored by academia.

It must be said that most of the amateurs were convinced beforehand that there was an early North American presence by the Celts, some Irish monks, and/or Vikings who had strayed farther south than Newfoundland. These amateurs did conduct a few tightly controlled excavations to look for telltale artifacts, but generally they were content to just measure and describe the chambers. Only a few radiocarbon dates have been produced in this effort. However, we do have emerging from the amateurs' work many carefully mapped chambers, some interesting astronomical alignments, records of associated, purportedly ancient inscriptions, and descriptions of anomalous stone structures associated with the chambers, such as curious cairns and stone rows. This accumulated knowledge does, on the surface, tend to link the northeastern stone chambers to their European analogs and thereby challenges the prevailing root-cellar paradigm. It is obvious, though, that a deep gulf still remains between the professionals and the amateurs.

As anomalists, it is incumbent upon us to take an objective look at what the amateurs have discovered, but still keep in mind that the professionals have looked rather carefully at some of the stone chambers and their peripheral artifacts. They do have some good reasons for firmly adhering to the root-cellar paradigm.

Dimensions of the stone-chamber phenomenon. Rather than describe the minute details of many stone chambers, we first present some general observations to give the reader a better appreciation of the phenomenon. Farther on, in X1 through X10, we will focus on ten kinds of information, amassed mostly by the amateur students of the chambers, that could in principle unseat the root-cellar paradigm.

The two most common varieties of old stone chambers were well described by M.F. Doran and B.H. Kunnecke in a 1977 issue of the now-defunct Anthropological Journal of Canada.

The structural type most common to the NEARA files is the simple covered passageway. These range up to 25 feet in length, though most are somewhat shorter. The passageways are formed by dry-walling on at least one side; some were constructed by augmenting a natural crevice, or by adding an outside wall to an appropriate facing of natural stone. They are narrow, usually only a yard wide or less, and about six feet in height. Those that we have seen were roofed with heavy slabs of stone, with a concealing overburden of earth. The passageways are generally found in isolated districts of New England, and are often known as "witches' caves" in local folklore.

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Also widely known to NEARA are "beehive" chambers, which are found mainly in the Massachusetts area. These structures are of dry-walling, but form small domed chambers through gradual corbelling inward to create roofs. They seem to be predominantly small and rather cairn-like, with ceilings no more than four feet high, but some are larger. These---most notably the one at Upton, Massachusetts---have high, arching ceilings up to 10 feet high, and passageways leading into them of up to a dozen feet in length. They often seem to have been covered with earth, which today is much eroded away. (R4)

Naturally, there are variations on these basic types in matters of style and size. Morphologically, at least, one can compare the northeastern stone chambers of North America with many similar European structures. They are also

morphologically related to some stretched-out North American underground stone structures that we classify as "tunnels," notably the shaft-tunnel system at Goshen, Massachusetts, and the Montville "souterrain" in Connecticut. (See MSE3 in Ancient Infrastructure for details on these other structures.)

Factors that might challenge the root-cellar paradigm. The root-cellar paradigm receives nearly universal approval from mainstream archeology and anthropology; and, as we have stated, there are many facts justifying this stance. Nevertheless, there are also facts that tend to weaken the paradigm. We list below no fewer than ten categories of potential paradigm challenges---each keyed to catalog entries.

- Contrary history and legends (X1);
- Stone-chamber distribution incompatible with colonial settlement patterns (X2);
- Really-convincing structural similarities to European stone chambers (X3);
- Evidence that the chambers were used in ways alien to colonists (X4);
- The discovery of precolonial artifacts, especially any from Europe (X5);
- Bona fide, anomalous ancient inscriptions very located near, inside, or somehow relating to the chambers (X6);
- Intimate connection with other potentially anomalous structures (X7);
- Chambers with dimensions incompatible with those of root-cellars (X8);
- Precolonial radiocarbon dates (X9);
- Convincing astronomical alignments (X10).

X1. Legends and history. There must be 200 books---not to mention many more

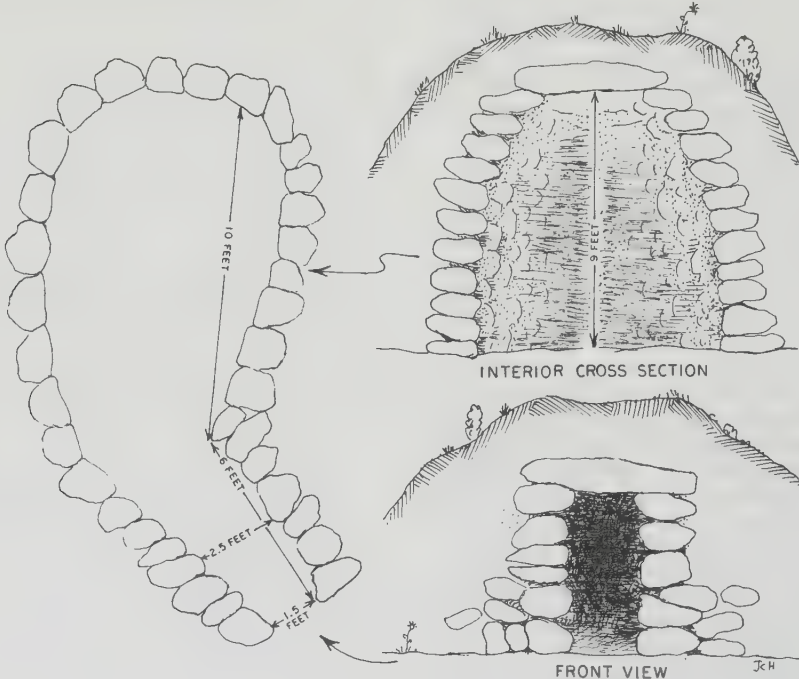
magazine articles and TV documentaries ---that make cases for Precolumbian contacts with North America. Almost all of these depend to some degree upon legends and recorded history to prove their theses.

It is generally agreed that the Norse did voyage repeatedly to North America about a millennium ago. These intrepid sailors might have constructed some of the stone chambers under scrutiny, perhaps, too, even the Newport Tower in Rhode Island. (MST1) After all, they did leave behind similar stone chambers in Greenland and Europe. If they did construct the northeastern chambers, their written sagas say little about them. The sagas do, however, state that they did find a white race on one of their voyages. (R3, R20) Could these have been Irish monks? Irish legends are full of tales of long, ancient sea voyages. Then there were the Welsh Prince Madoc and the Scotch Henry Sinclair. If we subscribed to the written word and tales handed down over the centuries, the

list of possible early visitors to North America (and potential crafters of rude stone chambers) would be a long one. (R5, R7, R18, R20, R23, R24, R32, R33) Romantic as these old stories are, we cannot give them much weight.

The point to be made here is that legends and old histories may allow us to speculate about chamber builders, but in no way can these vague tales endanger the root-cellar paradigm, which is supported by G. Neudorfer's study and the ponderous weight of professional opinion.

X2. Stone-chamber geographical distribution. People, whoever they were, constructed the northeastern stone chambers with some purpose in mind. If that purpose was the storage of root crops, the distribution of stone chambers should follow the colonial settlement pattern of northeastern North America. But if the



The Morse Pond stone chamber, Southbridge, Massachusetts. Note the internal corbelling and large capstones. (R22)

chambers were for the temporary sheltering of explorers, trappers, escaping slaves, or itinerant missionaries, their distribution pattern would accord with their routes, which were generally different from the settlement patterns.

Colonial settlement patterns. G. Neudorfer and the other professional archeologists who support the root-cellar hypothesis aver that the distribution of the northeastern stone chambers should and does conform closely to the pattern of rivers, arable land, major roads, and other features of a land being newly settled. This does seem to be the case, especially in Vermont, as Neudorfer has documented.

In the early 1980s, a group of Dartmouth students interested in "cultural geography" decided to take another close, scientific look at stone-chamber distribution in New England. They concluded:

The New England distribution of stone chambers seems to match early settlement trends. Vermont's chambers are particularly striking in this regard. Their location relatively close to major waterways coincides with the routes taken by early settlers. These pioneers first settled the higher ground, where the chambers are located. The Vermonters of the 18th and early 19th centuries were growing crops such as potatoes that could have required the development of a structure such as the stone chambers...Therefore, until or unless more conclusive evidence is found to the contrary, the stone chambers must be considered to date to the early agricultural settlement of Vermont. (R21)

Assuming this study was not unduly influenced by its academic origin, it provides additional strong support for the root-cellar paradigm.

Exploration patterns. The only accepted Precolumbian route to the New World carried Europeans with varied objectives across the North Atlantic, perhaps touching Iceland, Greenland, Labrador, Newfoundland, and New England. Do stone chambers mark this route? There are many such in Ireland and Greenland, but very few on the North American continent to the north of New England according to our sources. P. Ferryn has figured one from Labrador (R29), but

this crude structure could have been piled up by Eskimo hunters rather than Vikings or Irish monks. It does not seem pertinent to our question. Otherwise, the Canadian and Maine coasts are singularly free of stone chambers. In fact, most of the chambers attracting our attention are inland well away from the coastal routes.

Missionary routes. P.M. Perry, in his 1973 article in Popular Archaeology, made a bold assertion regarding the chambers that we have not seen mentioned elsewhere.

According to the Irish monks theory, these hillside caves provided overnight sleeping quarters for the evangelists. [L.] Girard points out that they lie along an east-west and a north-south route believed to parallel the paths taken by these monks in the New World, called by them "Great Ireland." As support for this theory, Girard points out many of these same caves, called "clochans" in Irish literature, can be seen in Greenland and Ireland to this day. (R3)

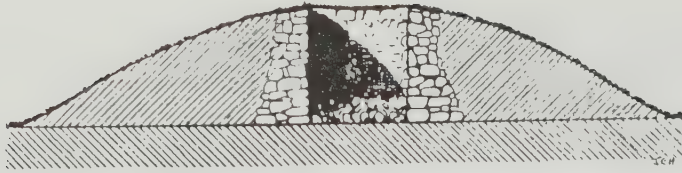
We must point out that no Irish artifacts have ever been associated with the northeastern stone chambers in the literature we have examined. Until we find some, the Irish-monks theory must remain just that.

Outliers. The stone-chamber phenomenon is unquestionably centered on New England and eastern New York state, conforming nicely with settlement patterns. Of course, there are some isolated chambers in this region that are harder to explain, but there were and still are isolated farms in New England.

The "outliers" that really attract our attention are those well outside the focal area of the phenomenon.

One such chamber was found within a mound in southeastern Minnesota. The mound diameter was 25 feet; the chamber height, 6 feet. Human bones and ashes were found at the bottom of the chamber. This structure does not look at all like the stone chambers under discussion. (See figure.) It is almost certainly the work of Native Americans. (R7)

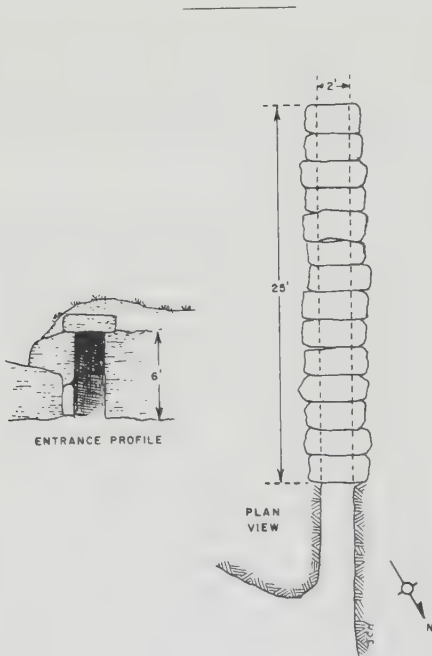
Closer to the typical New England chambers is one from northwestern New Jersey. Named the "Sandyston" chamber, its provenance is unknown; it could be



A stone chamber within an earthen mound from southeastern Minnesota. It is quite different from those in New England. Probably a grave. (R7)

modern. It is also not far from southeastern New York state, the location of many of the subject stone chambers. (R2) The Sandyston chamber does not tell us anything substantive about the builders of the hundreds of stone chambers a few miles to the north.

Summary. Stone-chamber distribution seems to be totally consistent with the prevailing root-cellar hypothesis.



New Jersey's Sandyston stone chamber is very long and narrow. Its style is quite different from that common in New England. Dimensions in feet. (R2)

X3. Transatlantic architectural similarities. As biological taxonomists are well aware, homologies can be misleading; that is, animals that look alike may not be genetically related. The same situation prevails in archeology. In X2 it is asserted that the North American stone chambers closely resemble the Irish clochans. This may be true on the surface but cannot prove conclusively that the ocean-separated chamber builders were related in any way. After all, there are not very many ways to build stone chambers using dry-wall masonry. This very point was pursued by A. Ross and P. Reynolds in their article in *Antiquity* in 1978 when discussing chamber architecture.

Certain structures, however, that are broadly comparable to those recorded in New England are found in the United Kingdom and on the continent of Europe. As the buildings in question are constructed of dry stone walling, the options are fairly limited, and the very diversity of structural method virtually assures some degree of similarity. For example, circular and semi-circular structures built entirely of dry stonework usually have a corbelled roof. Rectilinear structures of similar construction may also have a corbelled roof but may alternatively be covered with large slabs. Buildings of these types are known from many periods of pre-history and from documented historical times. Because of the limited number of building styles offered by the raw material, unless there are other concomitant dating materials or documentation available, it is almost impossible to date such structures on stylistic ground. (R6)

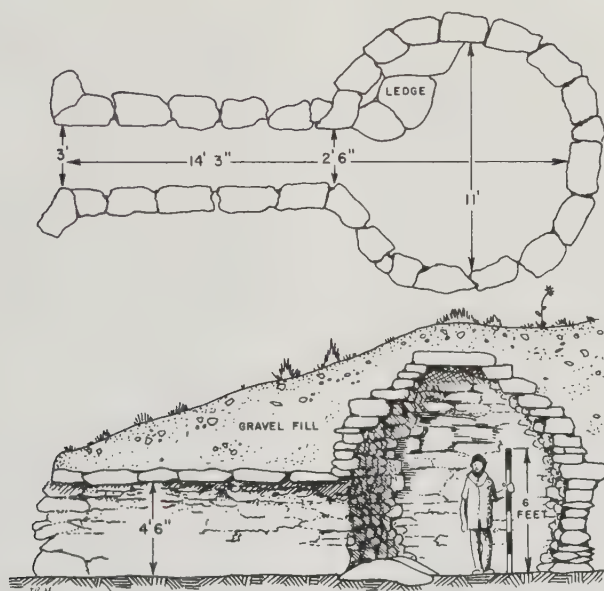
Even though thus warned, it is difficult to overlook the strong trans-Atlantic similarities in chamber architecture. This can be seen in the description of the Pearson chamber at Upton, Massachusetts, by J.W. Mavor, Jr., and B.E. Dix.

It [the Upton chamber] is on a slope that rises gently to the east, near the outside corner of two intersecting stone walls. Five large adjacent boulders, each weighing thirty to forty tons, form a portion of one of the walls. The chamber itself is a large stone "beehive," unquestionably architecturally similar to some in Ireland and Scotland. A circular under-

only the entrance lintel stone and facing stones exposed. (R24)

Mavor and Dix liken the Upton chamber to some European chamber tombs 5,000 years old as well as Christian cells merely 1,100 to 1,400 years old. But which, if either? Obviously, similarity is a poor guide in reconstructing North American history.

But don't discard the Upton chamber yet; it may have had significant astronomical alignments pertinent to this discussion. See X10.



The famous Upton, Massachusetts, stone chamber is of the "beehive" type. It is architecturally similar to some chambers in Ireland and Scotland. (R10)

ground inner chamber ten feet in diameter with a domed roof over ten feet high is connected to the outside by a long narrow sinuous passageway between fifteen and twenty feet long with an average width of 2.7 feet. It is of dry-wall construction using local granite split from bedrock and glacial boulders, built into the hillside with

X4. Potential anomalous chamber uses.

If it could be demonstrated that the northeastern stone chambers were used in ways alien to early American colonial life, this determination could destabilize the root-cellar hypothesis.

The glaring lack of artifacts makes it hard discover how the chambers were really used a century or two ago. That

some are used for food storage today is supportive of the root-cellar theory. Against this theory is the evidence that a few chambers, such as that at Upton, may have provided important astronomical alignments for someone. (X10) To our knowledge, early American farmers used almanacs and not stone alignments to plan their work. Astronomical features, therefore, could undermine the colonial theory of chamber origins.

Looking farther afield, could the chambers have been temporary shelters for those itinerant Irish monks, or for slaves escaping to the north, or refuges for settlers during Indian attacks? A few chambers might have been enlisted for such purposes, but without telltale artifacts such would be difficult to prove.

J.W. Mavor and B.E. Dix have championed the idea that many of the stone chambers were constructed by Native Americans for ritual purposes, perhaps for vision quests by individuals. As with the kivas of the Indians of the American southwest, the northeastern underground structures might have been links to the spirit world. Mavor and Dix wrote as follows:

We see stone chambers as but one of many elements of a ritual architecture in New England that is part of a long, profound and continuing tradition including the natural landscape and many types of indigenous man-made structures. To consider stone chambers in isolation or solely as part of a nearby farmstead or other settlements is a distortion of the record. We see antecedents for most chambers in similar stone structures with established provenance among Native Americans in other parts of North America. One, nearby, is the stone building of the Arctic people of northeastern Canada which has its origins in Archaic times. This tradition may go back to a time thousands of years ago when Arctic people travelled around the northern world diffusing certain traditions down into the temperate latitudes. With few exceptions, any specific architectural feature of New England chambers that has been mentioned in literature can be found elsewhere in North America, as well as throughout Europe. (R24)

Following the foregoing quotation,

Mavor and Dix hasten to claim that the Upton chamber is different! As mentioned earlier in this section, it may have been an astronomical observatory of sorts. Again, see X10.

X5. Dearth of precolonial artifacts. If an archeologist, professional or amateur, would unearth just a few incontestable precolonial artifacts from the stone chambers or their immediate vicinities, the whole climate of the debate would change. As mentioned above, the Neudorfer study yielded nothing of the sort. Neither did a later effort directed by J.R. Cole, an anthropologist from the University of Massachusetts. Cole and his students investigated nine chambers in detail, employing soil transects and test excavations. Cole concluded as follows in Current Anthropology.

The stone structures "look European"; this is not surprising, since they were apparently built by European immigrants in the historic period. There was, as most archaeologists would have predicted, no evidence found of pre-Columbian Old World settlement. There was a significant absence of pottery, tools, and structures other than the chambers themselves that would be expected if these so-called shrines were part of a larger settlement system (people do not live by shrines alone). Long-term, fairly intensive settlement in pre-Columbian times would have left cultural and biological evidence beyond shrines and inscriptions, yet no evidence has ever been unearthed of pre-Columbian gene flow, epidemics, horses, cows, pigs, sheep, goats, chickens, or other goods that would surely been of more significance to Native Americans than supposedly Megalithic structures. (R13)

A common reaction of the anti-root-cellar side of the debate is that the absence of artifacts does not mean they are not there. We just must dig more! Another retort is that H. De Soto's march through several southeastern states in the early 1500s left behind precious few artifacts, despite his army of about 1,000 soldiers and several pitched battles with Indians. The impli-

cation being, of course, that Precolumbian artifacts in the vicinity of the stone chambers might be likewise very rare. Perhaps so!

ogam and other types of inscriptions that are regularly presented by the tireless amateur epigraphers. Even then, it would be of much greater significance if Precolumbian artifacts---coins, tools, anything undeniably Celtic, Viking, Irish, etc.---were to be found in the immediate neighborhood of some of the controversial inscriptions.

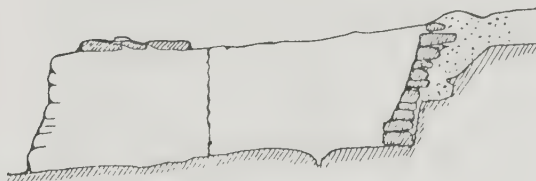
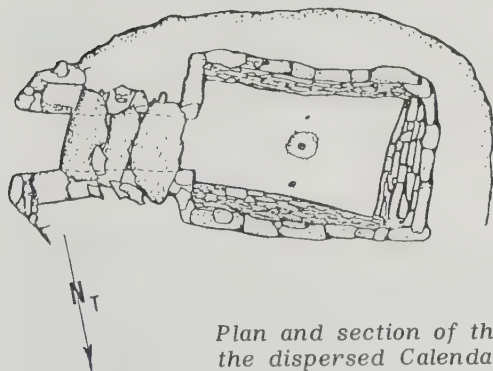
X6. Near-by ancient inscriptions. Those doubting the root-cellar hypothesis always introduce the surprisingly abundant, supposedly ancient, markings and inscriptions found in the same area as the controverted stone chambers. (In actuality, puzzling inscriptions are to be found all over North America. See MGW in another volume.) It was B. Fell who, in the 1970s, raised public interest in these inscriptions with his books. (R18, R23) American epigraphy has turned out to be just as contentious as the stone chambers. The two debates follow the same time track and are debated pro and con by the same people. We will delve more deeply into anomalous scribblings worldwide in MGW. Here, it suffices to confirm that anomalous inscriptions are just as real as the stone chambers, but they are dismissed just as vigorously, even more contemptuously, by the academic community. (R6, R14, R25) Again, the professionals are pitted against the amateurs. Each group publishes its own journals and goes to its own conferences.

The impact of the epigraphy debate on the closely related stone-chamber controversy will always be negligible until some irrefutable ancient European inscriptions are found, or some recognized, mainstream authority is finally convinced by the incredible quantity of

X7. Association of stone chambers with other controversial structures. One can forever debate whether the geographical association of one type of potentially anomalous structure with a different, equally enigmatic, structure legitimizes both. In other words, does the colocation of a chamber with a calendar site increase the likelihood that both were erected by ancient Celts, Vikings, etc. Essentially, this is the same question asked when stone chambers are found near mysterious inscriptions. (X6) University archeologists and anthropologists answer by dismissing both. Believers in many Precolumbian voyages to North America, on the other hand, will hold that the presence of one enhances the chances that both phenomena are real as well as anomalous. Emotionally, if not logically, colocation of different enigmatic structures does enhance the believability of radical hypotheses. This is especially true when large complexes of structures are involved, as at the Gungywamp site in Connecticut.

From a wide selection, we offer four interesting associations of this sort.

Calendar-I site, central Vermont. A stone chamber is positioned near the center of this calendar site. Significant astronomical alignments exist with stan-



Plan and section of the stone chamber located in the dispersed Calendar-I site in Central Vermont. (R33)

ding stones on surrounding ridges. Suspect stone walls and at least six additional stone chambers lie nearby. (Details in MSH21 in Ancient Infrastructure)

Upton chamber, Massachusetts. The Upton or Pearson stone chamber is one of the most intriguing in all of New England in terms of size (X3), construction, and possible astronomical use (X10). Its astronomical potential depends upon three spectacular cairns lined up north-south on a ridge about a mile away across a valley and pond. (R32) As with Calendar-I in Vermont, we seem to have here a stone chamber integrated into a megalithic astronomical complex. Interestingly enough, Britain's Stonehenge is also neatly integrated into the local topography and Bronze Age barrows are visible along the nearby ridges. (MSH14-X4 in Ancient Infrastructure)

Gungywamp site, Connecticut. One of New England's most curious complexes of old stone structures is located north of Groton, Connecticut. The site encompasses several large stone chambers, rows of standing stones, stone circles, cairns, stone walls---a virtual smorgasbord of megalithic structures. (R26, R28, R32) These varied lithic structures, allied with stone chambers, unquestionably add to the aura of mystery surrounding all of the similar stone chambers found all over the northeast. (See MSS2 for Gungywamp details and X10 for Gungywamp astronomy.)

Mystery Hill, New Hampshire. Near North Salem, tourists are attracted to a lithic complex described as "America's Stonehenge." The tourist hype is relatively recent. Mystery Hill, as it is usually called, has actually puzzled people for generations. Today, for a small fee, one can explore this 24-acre complex of chambers, tunnels, astronomical alignments, walls, and even a possible "sacrificial table." To be honest, Mystery Hill's role as a commercial enterprise probably detracts from its importance in the stone-chamber discussion. Even so, the stonework has definitely been there for many decades, and we do once again see stone chambers integrated into a large lithic complex, thereby acquiring a thin patina of authenticity, at least for those inclined to believe that Celts and Vikings were roaming New Hampshire over a millennium ago. (See MSS3 for more on Mystery Hill.)

X8. Dimensions incompatible with root-cellar use. Doubt can be cast upon the root-cellar hypothesis if stone-chamber dimensions seem to greatly exceed what would be required for vegetable storage. Of course, an out-sized stone chamber does not necessarily mean that it was built by Celts or Vikings. It could have been constructed by early colonists for some other purpose, perhaps as a refuge during Indian attacks. Size, therefore, does not make a chamber anomalous, but it can undermine the root-cellar paradigm.

Of the stone chambers already mentioned in this section, the Upton or Pearson chamber, in Massachusetts (X3, X7, X8), and New Jersey's Sandy ston chamber (X2) seem too large for mere crop storage.

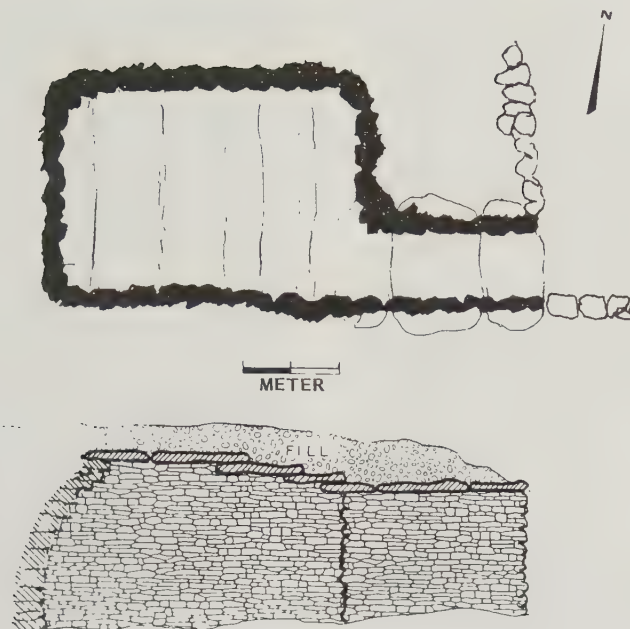
Another oversized chamber is located at South Woodstock, Vermont. Roofed with stone slabs, its floor plan measures 10 by 19 feet. Presumably one can stand erect in it. The doorway is aligned with the winter-solstice sunrise. (R32)



The atypically large stone chamber at South Woodstock, Vermont. It is roofed with large stone slabs. Note its rectangular geometry. Its very size militates against the root-cellar explanation. (P. Ferryn, Kadath)

A stone chamber at Webster, Massachusetts, one of five in the immediate area, is also unduly large to be a root cellar. It is entered through a passage-way 52 inches high and 6 feet long. Its interior is 7 x 10 feet. (R12, R17)

Two structures described in MSE3 in



The Webster, Massachusetts, stone chamber is unusual in that its interior is capacious and of rectangular shape. Its size suggests that it may not have been a root cellar. (R17)

Ancient Infrastructure are basically stretched-out chambers. They are the Montville, Connecticut, souterrain, and the Goshen, Massachusetts, shaft-tunnel. These, too, are much too large to have been only root cellars.

Hill, New Hampshire, as described by S.M. Trento.

A trench sunk by archeologist James Whittall over the so-called Oracle Chamber drain revealed tiny specks of charcoal from under one of the capstones. Radiocarbon dating yielded a date of around 520 A.D. From other excavations, Whittall obtained charcoal from between the slabs of a dry-stone walling. The samples gave a collected [sic] date of over 3,500 years! More recently an excavation at the northeastern section of the site revealed a 3,600-year-old date. (R32)

When asked about these dates, the professional archeologists suggested that the samples had been contaminated.

As a matter of fact, the professional archeologists are right to be suspicious. Radiocarbon dating has many pitfalls and, in the New England area, the suspect chambers and associated stone structures produce radiocarbon dates ranging from a mere 100 years to almost 3,500 years

X9. Precolonial radiocarbon dates. Radiocarbon dating has been a great boon to archeologists. They rely heavily upon it, except, it seems, when it comes to the dates of northeastern stone chambers.

In 1978, a drystone chamber, designated WD16, in Windham County, Vermont, was examined by a team from the Early Sites Research Society. A sample of charcoal extracted from an old humus layer was dated as 1405 ± 190 C-14 years old by Krueger Enterprises. (R8, R9) A date this old should have quickly brought academic archeologists running to the site, but no one in science's mainstream seemed interested!

A similar situation prevails at Mystery

B.P. (before the present). For example, a hearth at one of the the Gungywamp chambers yields a radiocarbon date of only 130 ± 75 years B.P. One charcoal sample from Mystery Hill has been pegged at $3,475 \pm 210$ years B.P. Another bit of charcoal associated with a stone chamber at the Pottie site, also in New Hampshire, as is Mystery Hill, has been dated at only 850 ± 140 years B.P. A list of 25 radiocarbon dates from various types of "suspicious" New England stone work compiled by J.P. Whittall, Jr., spans three millennia. (R35) With such a range of dates from these "megalithic" sites, it is risky to come to rash conclusions regarding any of them based on radiocarbon dates!

X10. Chambers with astronomical uses. Just because some of the northeastern stone chambers are astronomically oriented does not mean that Precolumbian adventurers from Europe built them. Native Americans were well-attuned to the motions of the sun, moon, and stars. They built their medicine wheels, lined up stones in north-south rows, and knew well that the position of the sun-rises on the horizon varied through the year. (MSH2 and MSH22 in Ancient Infra-structure)

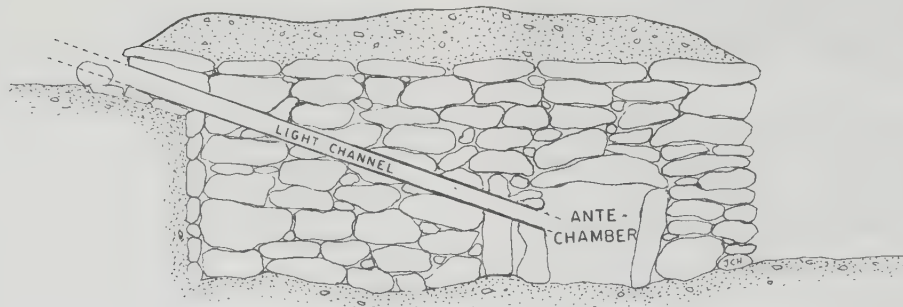
If Native Americans built some of the

controversial chambers for ritual purposes, as some suppose, it would be quite understandable if the doorways sometimes framed the sunrise at one of the solstices. This would be elementary astronomy for Native Americans. For example, the Anasazi kiva called the "Rinconada" was very likely a ritual structure, perhaps as some of the northeastern stone chambers may have been. Its entrance was astronomically oriented as are many other surviving Native American structures, including some in the northeast. (MSA1-X1)

The point being made here is that trans-Atlantic influences are certainly not required to account for the orientation of some stone-chamber entrances; as, for example, the chamber at South Woodstock, Vermont. And, of course, some chambers probably opened toward the east for the sole purpose of letting in warm sunlight on cold winter days.

Despite these cautionary remarks, there are some stone chambers in the subject area that seem to betray more sophisticated astronomy. Such "advanced" features do suggest that perhaps these particular chambers were not constructed solely for the winter storage of vegetables.

The Gungywamp light channel. A rather sophisticated astronomical device was discovered by D.P. Barron in 1984 at one of the stone chambers at the Gungy-



This remarkable stone chamber at the Gungywamp site, near Groton, Connecticut, boasts a light pipe similar in principle to that at New Grange, Ireland. Sunlight streams into the chamber only at the equinox sunsets. (R28)

wamp site in Connecticut. It is described in "The Greater Gungywamp Guidebook," written by D.P. Barron and S. Mason.

A most unique feature in this structure [Chamber #1] is its light channel or stone-lined tube, which is designed precisely to permit the Equinoctial sunset to fully penetrate the chamber's dark interior only two days during the year. The beam of sunlight, entering the 9" x 9" x 3'6" stone tube, illuminates the entrance of the hidden side chamber on the Equinox, March 22 and September 21. Both the upward angle and elevation of the light channel are precisely aligned to permit the illuminare effect as seen in ancient stone chambers in Europe. The high density of garnet in the stones appears to magnify the intensity of the sunlight entering the chamber. (as quoted in R28)

This light-shaft phenomenon is reminiscent of the "ports" in the walls of some Native American structures in the southwest. (MSA1-X1) Such deliberately introduced, astronomically significant, rather sophisticated devices would not appear to be the work of early colonists striving to preserve root crops. Nor is the Gungywamp light-channel easily ascribed to Native Americans known to have lived in New England.

The Upton stone chamber as an astronomical instrument. In attempting to link the stone chambers and archeoastronomy, we cannot avoid reintroducing the Upton chamber. This chamber is not only of remarkable size and unusual construction, but, like the the Gungywamp chamber with its light channel, it seems to be part of a deliberately constructed astronomical "instrument." Such "instruments" are exceedingly rare in New England and its surrounding states. In other words, it is difficult to brush off the astronomical features of the Upton chamber as "just coincidence."

First, some more basic facts about the Upton or Pearson chamber, as provided by S.M. Trento.

This chamber is intriguing. It is built entirely of dry-stone granite---no mortar was used to hold the stones together. They stay locked in due to the weight of one stone overlapping the other. A massive lintel stone

peering out from the side of a hill is the only indication that something is there. Stepping down into the opening brings one into a 15-foot-long stone-lined passageway that's a little more than 4½ feet high. At its end is a round chamber that corbels upward a little more than 10 feet. This is an astonishing piece of construction. (R32)

See X3 for additional description of this unusual chamber.

In their book *Manitou*, J.W. Mavor, Jr., and B.E. Dix add that the design of the Upton chamber is apparently unique to North America and, in fact, closely resembles the type of dry-wall architecture employed in Europe 5,000 years ago. (R24) The unusual structure of the Upton chamber plus its astronomical features provide excellent ammunition for those who do not believe that all of the northeastern stone chambers are root cellars.

Mavor and Dix and their colleagues have spent considerable effort in discovering how this chamber might have been used by its builders, whoever they were. They first noticed that the axis of the chamber passageway was closely oriented toward the summer-solstice sunset. That this might not be fortuitous could be shown if the horizon, as seen from inside the chamber looking down the narrow passageway, included a marker of some sort that could be lined up with the setting sun at the summer solstice. Following their archeoastronomical instincts, Mavor and Dix had two of their team reconnoiter Pratt Hill, which defined the western horizon a mile away. Amazingly, the hunch paid off. There were three stone mounds on the ridge. Then, wrote Mavor and Dix:

We all went to the top of Pratt Hill to inspect the three stone mounds, which were indeed spectacular. Two, apparently reasonably intact, are long irregular mounds at the eastern edge of the flat summit, oriented approximately north and south and aligned with each other, strung out along the edge of the hill. Each is about forty-five feet long with a gap of twenty-eight feet between. Together, they were later found to subtend an angle of one degree from the chamber. The third mound, ruined, is clearly not on the horizon from the

chamber. (R24)

The two intact stone mounds were labelled A and B. Neither, though, provided the desired solstice marker. However, the 6° field of view available to an observer inside the chamber included about 500 more feet of horizon to the north of mounds A and B. Sure enough, walking north along the ridge, Mavor came across a conical mound 6 feet high ---a perfect marker. This was named mound C.

Mound C did turn out to be aligned roughly with the chamber and the setting sun at the summer solstice. Knowing that the summer-solstice sunset point on Pratt Hill moved $1\frac{1}{2}$ feet south each century, Mavor and Dix calculated that the alignment would have been "precise" at 670 ± 300 A.D. This span of dates is obviously Precolumbian but it does overlap the time span of Norse exploration of the North American coast.

The above date was supported by mounds A and B. It was found that circa 710 A.D., Alcyone, the brightest star of the Pleiades cluster, would have grazed the top of mound A and set exactly in the notch in the horizon between mounds A and B. In other words, the Upton chamber coupled with mounds A, B, and C provided two important astronomical

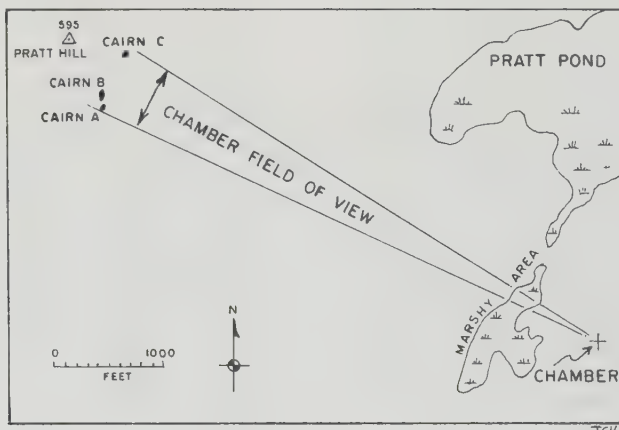
alignments. (R24)

If the Upton chamber and its associated mounds were located in Europe, most archaeoastronomers would not hesitate to declare that here was an ancient chamber built by an astronomy-wise culture.

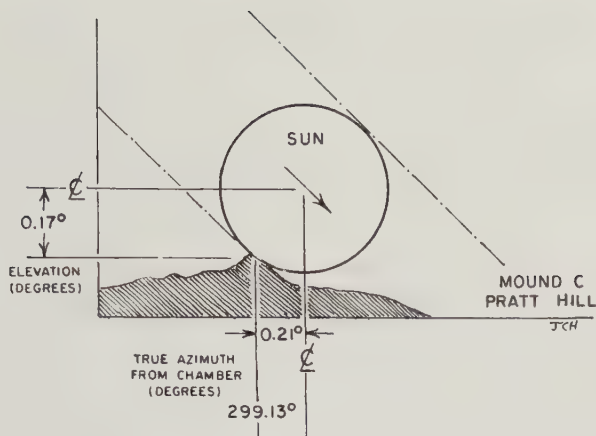
X11. Summary. The quantity of data available about the northeastern stone chambers is almost overwhelming. What does this mass of information tell us? Are the stone chambers colonial constructions or is there a strong hint that Precolumbian visitors crafted them? Perhaps neither side in this long-running controversy is completely on target. It could be that both sides err, and some of the chambers are Native American in origin---built for ceremonies, vision quests, and the like.

In the view of the compiler, who is hopefully neutral, the evidence stacks up as indicated below.

Data favoring a colonial origin. Written and oral history (X1); stone-chamber geographical distribution (X2); the existence of demonstrable colonial purpose (X4); extant colonial artifacts (X5).



The field of view observable from the Upton, Massachusetts, stone chamber. The chamber and Mound C are roughly aligned at the summer solstice. (R15)



A summer-solstice sunset as seen against Pratt Hill from the Upton chamber. (R33)

Data favoring Precolumbian origins.

The presence of associated anomalous stone structures (X7); the large sizes of some chambers (X8); the presence of significant astronomical alignments (X10).

Weak or inconclusive data. Architectural similarity to European structures (X3); the presence of nearby anomalous inscriptions (X6); radiocarbon dates (X9).

As reasonable position to take at this point in time---at least for the compiler---acknowledges that almost all north-eastern stone chambers have a colonial origin, but that a very few (Upton, Gungywamp, for example) are worthy of further study and excavation. The most critical data required consist of: (1) more artifacts unearthed from inside the chambers under controlled conditions; and (2) a long series of consistent radiocarbon dates for samples judged valid and admissible by professional archeologists.

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MSU2

Remarkable Passage Graves

Description. The unplumbed meanings of the unusual geometries, orientations, astronomical alignments, and bizarre stone carvings of the passage graves of western Europe. These passage graves, such as New Grange and Gavv'inis, are major architectural creations of Neolithic culture. They are full of poorly understood symbolism.

Data Evaluation. The passage graves have been the subject of intensive archeological research for many years. Research results and speculations as to their meanings appear in many professional and popular journals and books. Rating: 1.

Anomaly Evaluation. Ostensibly, western Europe's passage graves are merely elaborate tombs and require no special explanation. However, their common orientation toward the winter-solstice sunrise, their other astronomical alignments, the presence of human cremations, and, above all, the prolific enigmatic symbols carved in stone suggest metaphysical and artistic intentions that we have not yet been able to decipher. Speculations abound, but no one really knows what the megalith builders really had in mind when they planned and built the passage graves. Rating: 3.

Possible Explanations. See X5 below.

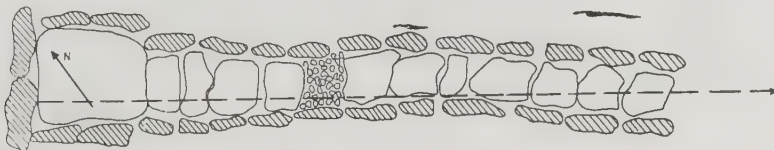
Similar and Related Phenomena. The stone chambers of northeastern North America (MSU1); the passages of the Great Pyramid (MSP7); the Maltese temples (MSB7); acoustical properties of passage graves (MSU3); Stonehenge and other stone circles (MSH7 in Ancient Infrastructure).

Entries

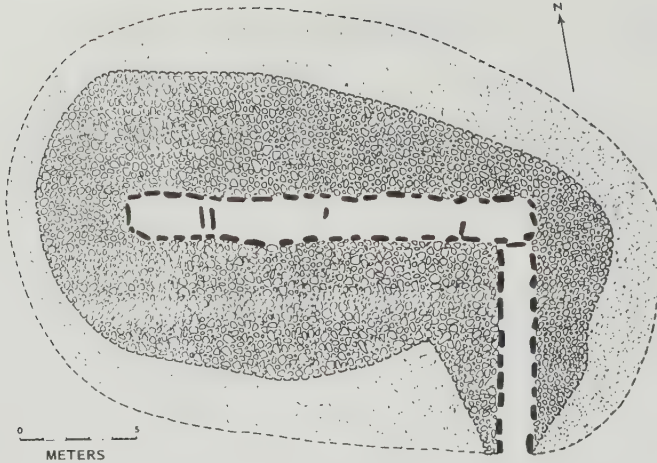
X0. Introduction. The megalith builders of Europe constructed elaborate "passage graves" before they erected Stonehenge, and even before the ancient Egyptians built the Great Pyramid. Passage graves consist of long, stone-lined passageways that penetrate large artificial mounds or cairns and terminate in one or more chambers. Probably most of the passage graves were exactly what their name

boldly states; that is, "tombs," most likely tombs for important persons. But some may have been something more than mere graves, as we shall see below. In fact, the central mystery of the passage graves is the larger purpose for which some seem to have been built---some purpose that we sense exists but which still eludes us.

Whatever the real purpose of the pas-



Passage graves are characterized by long stone-lined passages ending in one or more chambers. Here we have the Gavv'inis passage grave near Carnac in Brittany. The passage is aligned with the rising sun on the winter solstice. (R14)



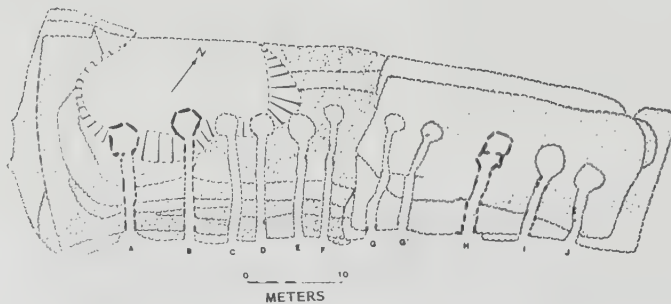
The unusual right-angled passage grave at Gavres, France. (R20)

sage graves was, the European cultures of about 4,000-7,000 years ago invested much energy and ingenuity in their construction, trying, we believe, to integrate these structures into their earthly surroundings and also to orient them with respect to some aspect of the heavens.

The best known passage grave is New Grange, in Ireland; but it is neither the biggest, nor the oldest, nor the most complex. New Grange, however, has been restored to its former magnifi-

cence, and is now an impressive tourist destination. It is also well-studied by the archeologists, so we refer to it often as representative of the species.

Passage graves are often quite complex. At Gavres, in France, for example, the long, straight passage of New Grange is replaced by a right-angled passageway. (See sketches.) Passage graves are not all singular. The massive Barnenez cairn on Finisterre is pierced by a total of eleven passage graves. (R20) Barnenez is 72 meters long and



The huge Barnenez cairn on Finisterre is pierced by 11 separate passage graves. It is 72 meters long. Photograph and more details in MSM3-X1 in Ancient Infrastructure. (R20)

about 4,700 years old---truly a massive accumulation of stones.

It is important to add that the passage graves belong to a genus of megalithic structures that includes many rather similar structures. In Europe, for example, we find megalithic tombs in a range of different sizes and geometries. The specialists separate these into: "chamber tombs," "wedge tombs," "portal tombs," "court tombs," etc. (R20) While certainly of great interest to the archeologists, we do not see that these other megalithic tombs present us with any anomalies beyond those we see at the passage graves.

X1. General observations. Let us first put the passage graves into the megalithic context.

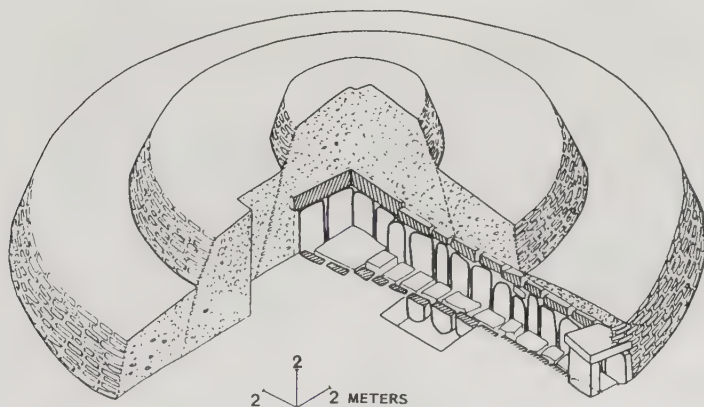
When the traveller views Stonehenge and the great complex of megalithic structures in the environs of Carnac, in southern France, he or she is seeing the accumulated labors of over 3,500 years of a remarkable culture that attempted to come to grips with the cosmos through rituals and ceremonies centered on various kinds of stone structures. This tremendous span of time---roughly 5,000-1,500 B.C.---is difficult for us to grasp. The entire history of the United States is less than one-tenth the

Megalithic Age. Given their 3,500 years, it is not surprising that we find the remains of megalithic structures in great variety spread all across Eurasia and into the Middle East and parts of Africa.

The passage-graves and their enduring mystery can be appreciated by thumbnail sketches of four prominent examples; specifically,

- Kercado (the oldest of the passage graves),
- Gavr'inis (the largest),
- New Grange (the best-researched) (X2), and
- Maes Howe (the best stone-masonry) (X3).

Kercado. In Brittany, just northwest of Carnac, there is a large, grass-covered mound crowned by an erect stone slab. Another standing stone guards the entrance to a short passageway leading to the center of the mound. There, the passageway opens into a square chamber about 10 feet high where human remains were found. Samples from these burials have been carbon-dated to 4,700 B.C., approximately 2,000 years before the Great Pyramid rose above the Giza Plateau in Egypt. The entrance to this passage grave points almost exactly to the winter-solstice sunrise. (R7, R8) This orientation indicates that, almost



Cutaway view of Gavr'inis. Its overall geometry and the astronomical alignment of its passage are similar what is seen at New Grange in Ireland. Gavr'inis was built about 3,500 B.C. (R14)

7,000 years ago, Kercado's builders were well aware of the yearly movement of the sunrise along the eastern horizon. Why they chose this orientation is not known for certain, but it is a feature of most megalithic passage graves.

Gavr'inis. The largest of the passage graves was completed about 3,500 B.C., or 1,200 years after Kercado. It is noted not only for its large stones and overall dimensions but also its amazing display of enigmatic carvings.

E. Haddingham has provided a concise description of Gavr'inis.

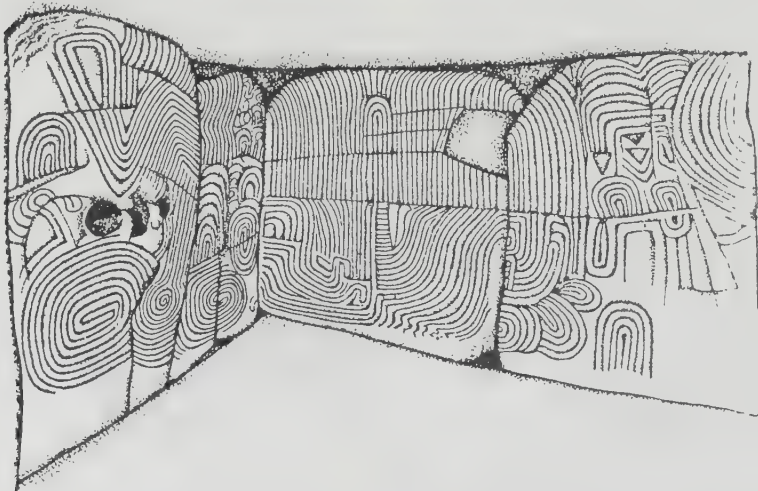
In the middle of the Gulf of Morbihan [just west of Carnac] there rises a small island, its south side sloping deeply down to the water, so that from the top of this hill a commanding view of the pattern of islands within the circle of distant coastline may be obtained. On this summit stands the burial mound of Gavr'inis, a round heap of earth covering a megalithic tomb of major importance. Within the mound twenty-four large uprights support a line of massive roofing slabs, in places over twelve feet across. This forms the passage, leading to the square chamber, which is roofed by huge rocks, one of them over twenty feet long, resting on the

upper edges of the six wall stones. The effect is impressive, particularly the smooth workmanship and precision of the joints between the stones, but by no means overwhelming---the visitor has to stoop slightly, even standing in the central chamber. (R8)

As at Kercado, Gavr'inis is oriented toward the winter-solstice sunrise. (R14) M. Brennan, however, adds that the main orientation of the passageway "is focused on an extreme rising position of the moon." (R15) This lunar connection is unusual and, if confirmed, its meaning is unclear.

The carvings at Gavr'inis are remarkable and add to the mystery of the passage-grave phenomenon. A. Service and J. Bradbery write about them as follows.

Gavr'inis is quite simply the finest decorated passage grave of all, with Newgrange in Ireland as its only possible rival. Twenty-three of the twenty-nine [sic] great slabs which form the walls of Gavr'inis are carved with intricate spirals, intersecting multiple semicircles, and other whorled patterns. It is not known whether these patterns are purely decorative or whether they have some religious significance. A meaning or a symbolism seems likely, since the

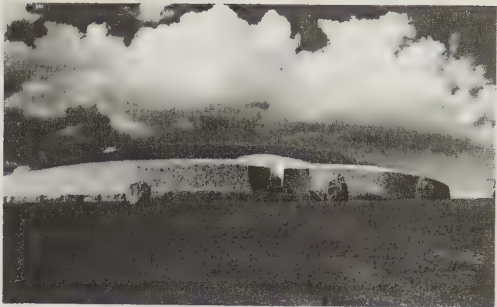


Twenty-three large decorated stone slabs line the walls of Gavr'inis. The meaning of these abstract designs, if any, is obscure. (R15)

spiral forms occur so often in Neolithic carving, but the code remains hidden. (R7)

Gavr'inis tells us that its builders, some five millennia ago, knew how to transport massive stones over the sea to an island and assemble them into a structure with solar and perhaps lunar alignments. They then deeply carved the stones with patterns that seem to express some transcendental meaning that escapes the modern mind.

The weird motifs at Gavr'inis are found at many megalithic sites. They are again prominent at New Grange. Some assert that these carvings had astronomical meanings, but this interpretation is debated.

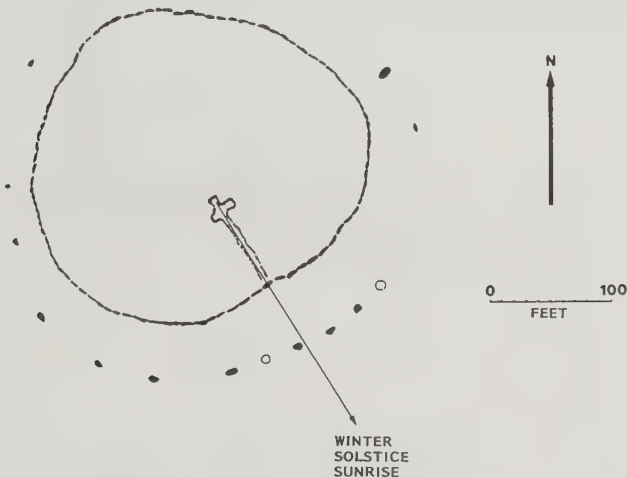


New Grange, now restored, is an impressive, strangely beautiful structure.

X2. New Grange. Situated some 26 miles north of Dublin, in Ireland's County Meath, the passage grave of New Grange overlooks the scenic Bend of the Boyne. New Grange may not be the oldest nor the largest of western Europe's passage graves, but it vies for the title of the most splendid. Now restored, its frontage is faced with gleaming white quartz visible from miles away. New Grange is not alone above the River Boyne. Two

other important passage graves are its satellites. Knowth is visible to the northwest; Dowth to the north east. Mounds and standing stones are also nearby. New Grange itself is surrounded by a ring of standing stones, whose significance is unknown. New Grange is, in fact, the hub of a spectacular Neolithic complex dating from about 3,300 B.C., a date preceding Stonehenge by about 500 years and well before the Great Pyramid took shape in the minds of the ancient Egyptians.

From the air, New Grange seems only a flat, heart-shaped mound girt by



Plan of New Grange and its surrounding stone ring. (R16)

standing stones also tracing out a heart. The heart shape doubtless had some meaning to the builders, but we have no inkling of what it was. Approaching on foot, and after being suitably impressed by the white-quartz facade, one finds the mound's passageway blocked by a large entrance stone deeply incised with spirals and other symbols which, like the heart-shapes, had some meaning 5,300 years ago. Behind the carved entrance stone, the passage opening is crowned by a smaller opening called a "roof box." This is precisely positioned such that the rays from the rising sun on the winter solstice pierce the dark passage and illuminate the main chamber deep inside the mound.

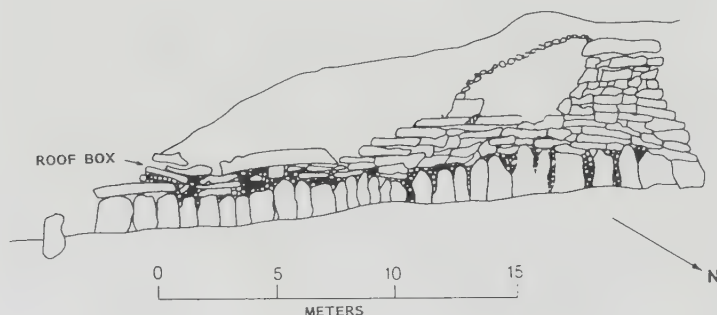
That the construction of New Grange was a well-planned and executed enterprise is evident in a paragraph penned by E. Hadingham.

The construction of Newgrange, which took place around 3300 B.C., was an extraordinary engineering operation. At least four hundred giant glacial boulders were carefully selected and assembled to make the passageway, chamber, and encircling kerb-ring. The roof was a daringly conceived vault of overhanging or corbeled slabs, each one piled on the next until the final covering stone was nearly twenty feet above the chamber floor. The tomb was buried under an immense mound composed of neat layers of turf and water-rolled peb-

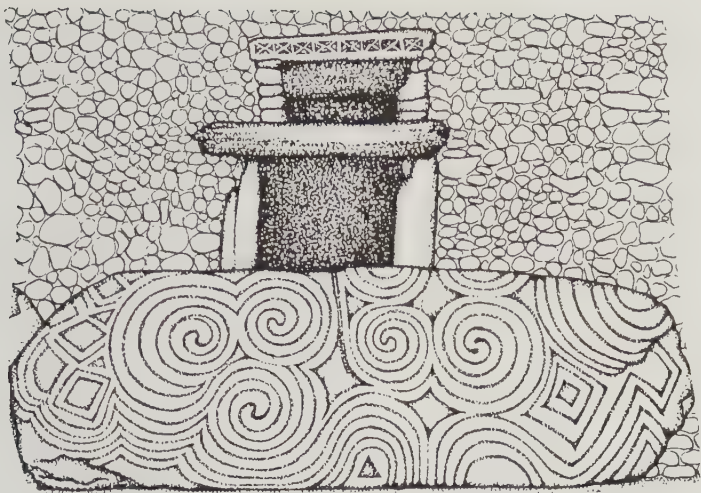
bles. The competence of the builders was only fully appreciated after years of excavation and restoration directed by the Professor of Archaeology at Cork University, Michael J. O'Kelly, and his wife, Claire. Astonished at the discovery of an ingenious system of carved drainage canals to divert rainwater off the top surface of the roof slabs and hence away from the interior of the tomb, Claire O'Kelly commented that "it becomes more and more evident that the building of Newgrange was no trial-and-error, hit-and-miss affair, but the work of practised builders who fully appreciated the factors which would best assure long life for their monument. (R17)

Stone carvings are in evidence in many places in New Grange proper and even on some of the standing stones surrounding the mound. There are even hidden carvings that would not have been visible in the completed passage grave. For example, the back of the corbel holding up the roof-box lintel is engraved with cupmarks, circles, and other designs. (R15) Perhaps these hidden symbols had astronomical or metaphysical significance. Who knows today?

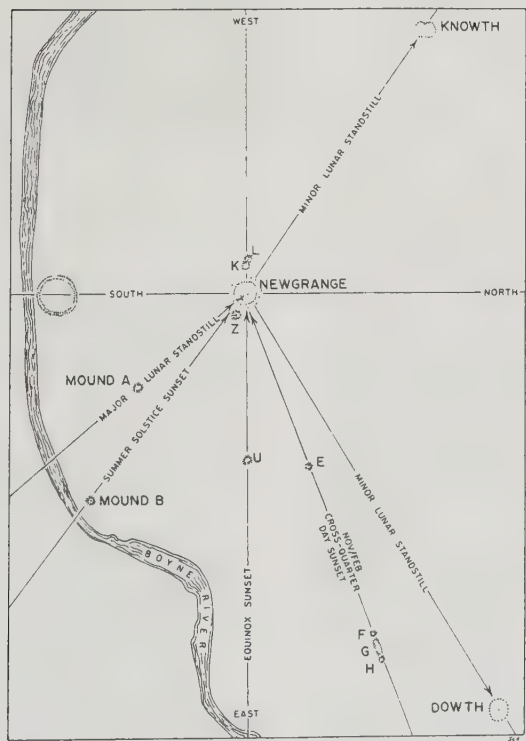
Most descriptions of New Grange focus on that beam of light that flashes down New Grange's passageway at sunrise on the day of the winter solstice. The satellite passage graves of Knowth and Dowth are also oriented in like man-



Section of New Grange showing the position of the light box. On the morning of the winter solstice, light streams down the passage and illuminates the main chamber. Across the Atlantic, a similar phenomenon occurs in a stone chamber in the Gungywamp complex, Connecticut (MSU1-X10). (Adapted from R11)



Many elaborate, enigmatic stone carvings decorate New Grange---some even concealed from the casual observer. This slab illustrates the ubiquitous spiral motif. (R15)



Map of the New Grange complex showing the astronomical alignments of the various structures. (R15)

ner. However, the astronomy of the New Grange complex may go well beyond this solar alignment. M. Brennan has mentioned some other possibilities not usually discussed by other writers. According to Brennan, the vector from New Grange to Knowth to the northwest marks a minor lunar standstill. Dowth, to the northeast marks another minor lunar standstill. Mound U, to the east, and New Grange are aligned to the equinox sunsets. A line drawn through Mound A and New Grange points to a major lunar standstill. (R15) New Grange, in this view, was a more sophisticated astronomical "instrument" than usually acknowledged.

Manifestly, the builders of New Grange and its environs were guided by the motions of the sun and, perhaps, the moon, too. Those enigmatic carvings may have had astronomical significance, or they could just be Neolithic doodles. The accumulated cremated remains found in New Grange's chambers are likewise puzzling.

Since New Grange, Maes Howe, Gav'r'inis, and many other megalithic sites in western Europe display many common motifs, orientations, and structural similarities, we have collected a few of the many speculations concerning the "meaning" of all these features in X7.

New Grange was only one expression of a culture that lasted thousands of years, spanned all of western Europe, even extending into North Africa, the Middle East, and perhaps farther.

X3. Maes Howe. Some 500 years after the completion of New Grange, about 3,150 B.C., the inhabitants of northern Scotland raised another, rather different passage grave. Called Maes Howe, it is one of twelve passage graves sprinkled about the Orkney Islands that jut out northward from the tip of Scotland into the cold, stormy Atlantic. The Orkneys, despite their harsh climate and remoteness, like Ireland's Bend of the Boyne, support a remarkable concentration of other sorts of megalithic structures: different sorts of tombs, stone circles, etc. But it is Maes Howe that stands out as an exemplar of the megalithic urge in Scotland. Maes Howe, along with New Grange and Gav'r'inis---all more than 5,000 years old---represent the zenith of

megalithic architecture.

Maes Howe differs from New Grange and Gav'r'inis in its technique of construction. Instead of using rough, unworked stones, the Maes Howe engineers drew upon the locally available, well-known (to geologists, at least) Old Red Sandstone. This sedimentary rock splits nicely into rectangular slabs, allowing the stone masons to lay regular courses and achieve finely finished walls in the passageway and chambers. (R11) J. and C. Bord admired the finished product in the following words.

The skill demonstrated in the stonework shows that the men who built Maes Howe were no savages, but true craftsmen. No mortar was used, and some of the slabs still fit so well together that a knife blade cannot be inserted between them. The tomb is covered by a large mound about 24 feet (7.3 metres) high and 115 feet (35 metres) in diameter, and a long passage (36 feet/11 metres) leads to a tall chamber 15 feet (4.6 metres) square, deep in the mound. In one wall is the doorway, but each of the other three walls contains a square hole nearly 3 feet (1 metre) above the ground. These open out into small chambers which once may have contained burials, and in front of each opening the large stone which was used to block it still stands on the floor. (R10)

The excellence of Maes Howe's stonework so impressed P. Tompkins that he did not hesitate to compare it to that at the Great Pyramid. In addition, Tompkins was intrigued by other similarities between Maes Howe and the Great Pyramid.

One of the most remarkable of these prehistoric European mounds still exists at Maes-Howe, near Stennes, in the Orkney Islands. It is equipped with a 15-foot square observatory chamber and a 54-foot sighting tunnel. The tube is aimed at a conspicuous man-raised monolith 42 chains (2772 feet) from the entrance, which lines up with a spot on the horizon where the sun now rises 10 days before the winter solstice. Another monolith, to the west, called the Watchstone, indicates the equinoxes. Like the Great Pyramid of Cheops, the observatory



*The entrance to the passage grave of Maes Howe, on Orkney, Scotland. Note the very fine stonework.
(Gerald Ponting, Fortean Picture Library)*

chamber is built of huge megaliths and its ceiling is corbeled. There are also three "retiring rooms for the observers," somewhat like the Queen's Chamber in the Great Pyramid. (R5)

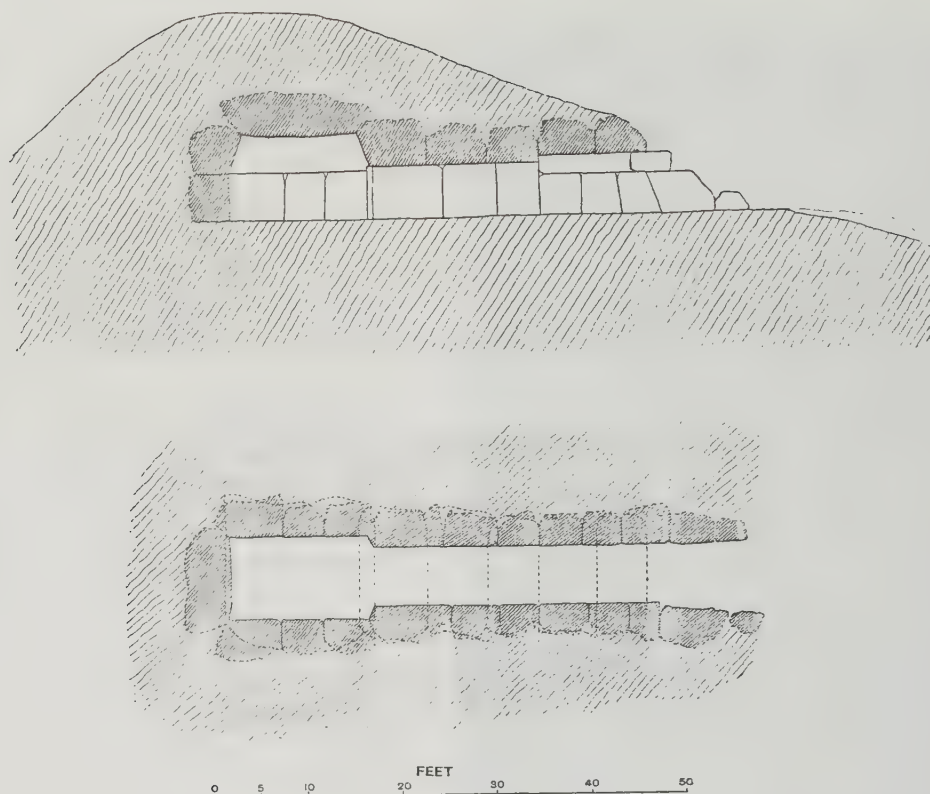
While the winter-solstice-sunrise alignment is confirmed in our other references, they are mute on the use of the Watchstone in equinox observations. It seems that Tompkins may have overstated the role of Maes Howe as a dedicated observatory.

Finally, unlike New Grange and Gavv'inis, Maes Howe is apparently almost devoid of those puzzling carvings that adorn so many other megalithic structures. Does this mean that Maes Howe played a different role in the megalithic culture?

Far East. In China, Korea, Japan, India, Indonesia, and elsewhere, dolmens, stone circles, and menhirs very much like those at the far western end of Eurasia have long attracted the attention of archeologists. (See MSD4 in Ancient Infrastructure.) Especially in Japan we find analogs of the European passage graves. The accompanying sketch of one of these analogs at Koshi, Yamato, Japan, could, except for its recency, just as easily be assigned to Ireland.

G. Eogan, a prominent Irish archeologist, has commented on the close similarities of Irish passage graves and Japanese tombs. In particular, he has singled out the Ishibutai Tomb, in Nara Prefecture, as an Irish megalithic look-alike. However, despite the close resemblance, the Japanese tombs were built several millennia after New Grange and Gavv'inis in Brittany. (R24) Eogan was also quick to point out another important difference: the Irish passage graves were mass-graves for cremated

X4. Japanese passage graves. Megalithic remains are surprisingly profuse in the



A Japanese passage grave at Koshi, Yamato. It is very similar to Irish passage graves. (R3)

remains, while the Japanese tombs were tombs for individuals. Further, the mysterious carvings of New Grange and Gavv'inis are lacking.

Considering the great gulfs of time and distance separating the Irish and Japanese structures, not even the most ardent diffusionist suggests that the structures resemble each other because of cultural diffusion. Like pyramids, passage graves are simple structures that are easy to conceive and build. Their purposes may vary though.

We should apply the lesson of the Japanese tombs to those stone chambers in northeastern North America. (MSU1) Even though these simple chambers look like European passage graves---albeit with shorter passageways---the existence of megalithic-look-alike Japanese passage graves tells us that we do not need to invoke an ancient European influence in

North America to explain those controversial stone chambers.

X5. Implications of the passage graves. New Grange, Maes Howe, and Gavv'inis clearly tell us that the megalithic culture of western Europe owed little to ancient Egypt in matters architectural. E. Hadingham wrote as following on this matter.

The new knowledge that the architectural masterpiece of Newgrange was assembled at the same time as the pyramids were rising in Egypt should dispense forever with the notion of 'barbarians' living in the shadow of of innovation from the East. Our barbarians had brains, and startlingly

original ideas. By about 3500 BC a strong and distinctive culture was flourishing throughout Britain. How did this come about? (R8)

Haddingham was probably correct in his assertions that ancient Egypt and western Europe were disconnected culturally. This observation is interesting but not germane to our pursuit of anomalies.

To this end, we must now ask: (1) why the passage graves of western Europe were oriented toward the winter-solstice sunrise; (2) why the rays of this particular sunrise only were admitted to the central chambers; and (3) why enigmatic carvings adorn so many megalithic sites. The anomalousness of the passage graves is tied to these questions, not to their sizes, the character of their masonry, nor even their ages.

Some authorities have concluded that some of the passage graves were primarily astronomical observatories. M. Brennan, for example, likens New Grange to a giant sundial and asserts that all of the strange carvings positioned nearby record astronomical and cosmological observations. (R19)

Few other archeologists agree that the passage graves were mainly observatories. Rather, opinion trends toward mystical, deeper interpretations, as in the following speculative statement in The Atlas of Mysterious Places:

Newgrange is not just a sundial or an observatory. It appears to be a symbol of the life-force itself. In its original form the mound covering the passage grave was egg-shaped, and into the life-bearing egg penetrated a long passage ending in a cavelike chamber, possibly symbolizing the womb. Inside stands a tall pillar of phallic shape, and the pairs of chalk balls found at Newgrange may also have been sexual symbols. (R19)

Interestingly, stone spheres have been found at some of the other ancient sites that we find hard to interpret with our modern mind-set; the Maltese temples, for example. (MSB7)

E.C. Krupp prefers to relate New Grange to life, death, and our place in the cosmos. Here are his thoughts:

The people who built Newgrange left us no written accounts of their cere-

monies. We cannot reconstruct the imagery of their beliefs. Even so, the themes of Newgrange are clear. Death, the sun, and the winter solstice are all interrelated there. Winter solstice can be the death of the year and the birth of the year. Combining sunrise with winter solstice suggest both death and rebirth. Death for certain, is part of Newgrange. It was, after all, a tomb. But the cremated bones cocooned within it seem all too few to represent a community cemetery. The deposits of ash are small and perhaps special. They may be symbolic components of a structure designed more or less for ritual than for disposing of the dead. Penetration of a darkened chamber by revivifying sunlight makes the event seem like a metaphor modeled on fertility, sanctified by the dead, and mobilized by the sun. Newgrange as a communal enterprise served a communal purpose. It embodied a celestial rhythm that organizes the world and energizes life. It reflected back to the people who built it, the theme that prompted them to do so. Whatever it meant to them in detail does not matter. Their sense of community and their sense of place in the world were enhanced by a monument that brought the sky in touch with the earth. As in Egypt and China, in Cahokia and Palenque, their dead had joined the cosmic circuit. Their mortal remains, carefully consecrated in the symbolic landscape, preserved the world's order for the living left behind. (R16)

In the end, it is all speculation. We cannot really get inside the heads of people who have been dead for 5,000 years and who lived in a world so different from ours.

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MSU3

Remarkable Acoustical Properties of Neolithic Passage Graves

Description. Experimental and theoretical demonstrations that some Neolithic passage graves are configured so as to promote the creation of acoustical standing waves and Helmholtz resonances. Geometries conducive to such phenomena could be either intentional or fortuitous. Postulated sound generators include drums and human chanting.

Data Evaluation. Experiments and theoretical calculations were conducted by professional scientists and duly reported in science journals and university reports. Rating: 1.

Anomaly Evaluation. The impetus driving the research described in this catalog section is the suspicion that Neolithic humans may have intentionally built or modified passage graves in order to enhance acoustical phenomena for the purpose of impressing worshipers and/or inducing altered states of consciousness. However, it is hard to prove such intent. By way of illustration, many natural and artificial structures are unintentional sources of strange sounds; i.e., musical valleys and whispering galleries. Passage-grave geometries, like those of soft-drink bottles, are very simple from the acoustical standpoint. By controlling the geometries of their passage graves and the placement of reflecting surfaces, Neolithic men could have easily produced unusual sound.

The weird acoustical phenomena experienced in these ancient structures could easily be accidental. But the fact that similar acoustical phenomena are found at ancient rock-art sites and at Neolithic stone circles encourages the surmise that at least some passage graves were deliberately constructed or altered to enhance sound effects. Such precocious acoustical engineering would tell us that Neolithic humans were highly perceptive, aware of cause-and-effect, and willing to experiment in a more-or-less scientific fashion to achieve desired sound effects. This view contradicts the popular impression that the humans living 5,000 years ago were brutish and barbarous. Rating: 2.

Possible Explanations. Neolithic humans were more intelligent and innovative than usually portrayed.

Similar and Related Phenomena. Recumbent stone circles (MSH8 in Ancient Infrastructure); acoustical phenomena at rock-art sites (MGP in another Series-M volume); acoustical phenomena at Chichen Itza (MSP1-X2); natural melody (GSM in Earthquakes, Tides); altered states of consciousness (PBS in a Series-P catalog); effects of infrasound on humans (BHB3 and BHB5 in Biological Anomalies: Humans I).

Entries

X0. Background. During rituals at today's ceremonial sites---churches, synagogues, mosques, etc.---one customarily hears music, chanting, and sundry acoustical devices. These enhance the rituals. In fact, churches and other ceremonial sites are often specially designed to create various acoustical effects. It should come as no surprise, then, to discover that Neolithic humans also appear to have enlisted sound in their rituals and, to this end, they chose and modified their sites accordingly. Of course, we can never be absolutely certain that the ancient acoustical engineers understood how to achieve standing waves, reverberations, and echoes. All we know is that our modern scientific instruments record curious and interesting effects at some ancient sites.

Some of the most impressive feats of acoustical engineering, whether deliberate or not, occur within stone chambers

and passage graves. Before examining some of these structures, a quick review of acoustical phenomena at three other types of ancient sites will set the stage and be instructive as well.

Rock-art sites. S. Waller has visited rock-art sites in Europe, North America, and Australia. Standing well back from the painted walls, he claps or creates percussion sounds, and records the echoes bouncing back. A casual observer of his seemingly eccentric actions might be tempted to call 911. It turns out, though, that there is method in his madness. Rock art seems to be placed intentionally where echoes are not only unusually loud but are also related to the pictured subject matter. Where hooved animals are depicted, one easily evokes echoes of a running herd. If a person is drawn on a wall, the echoes of voices seem to emanate from the picture itself!

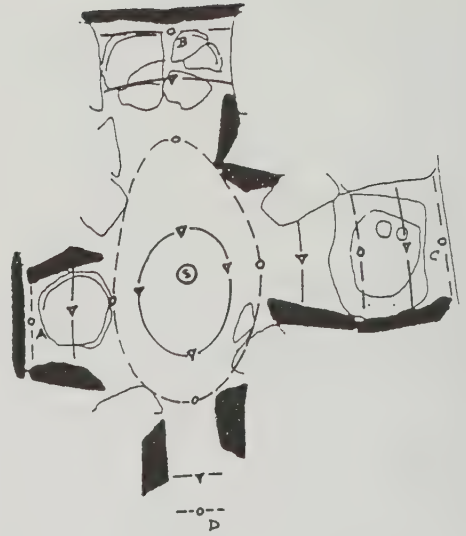
(R1)

Caves. A fascinating article in *Pour la Science* has described how ancient paintings in some of Europe's famous decorated caves were placed where sound resonated. The long cave galleries act like organ pipes. Sound, natural or artificial, peaks at specific spots in the cave galleries. Neolithic humans noticed this and drew their pictures accordingly. (R5)

Stone circles. Casual observers at Easter Aquorthies, a recumbent British stone circle, have often remarked on curious echoes and reverberations heard inside the ring of stones. It seemed that the recumbent stone with its flankers and projecting stones were focussing sounds towards occupants of the ring. Using an artificial sound source, instruments confirmed this focussing of sounds within the ring but did not record the subtle reverberations often detected by humans. It seems that Easter Aquorthies was designed deliberately to enhance the acoustical and visual effects experienced by audiences occupying the ring during ceremonies. (R6)

X1. Acoustics of stone chambers and passage graves: The Jahn-Devereux Studies. More germane to this catalog section is the research conducted by two different groups involving Neolithic passage graves.

The first group, consisting of R.G. Jahn, P. Devereux, and colleagues, took sound generators and meters into the chambers of six Neolithic passage graves and measured their acoustical properties. The sites selected were: Wayland's Smithy, Chun Quoit, and Cairn Euny, all in the Britain; Newgrange and Cairns L and I, Carbane West, all in Ireland. All of these sites date back to about 3,500 BC. The chambers were all bounded by roughly hewn stones, but they had very different configurations. New Grange was cruciform (see sketch); others were rectangular, beehive, and petal-shaped. Quoting the abstract of the project's report, as published by Princeton University, here is what the acoustical surveys found:



Acoustical nodes and antinodes in the New Grange chambers. Antinodes occur at the walls of the chambers. (R2)

Rudimentary acoustical measurements performed inside six diverse Neolithic and Iron Age structures revealed that each sustained a strong resonance at a frequency between 95 and 120 Hz (wavelength $\sim 3\text{m}$). Despite major differences in chamber shapes and sizes, the resonant modal patterns all featured strong antinodes at the outer walls, with appropriately configured nodes and antinodes interspersed toward the central source. In some cases, internal and exterior rock drawings resembled these acoustical patterns. Since the resonant frequencies are well within the adult male voice range, one may speculate that some forms of human chanting, enhanced by the cavity resonance, were invoked for ritual purpose.

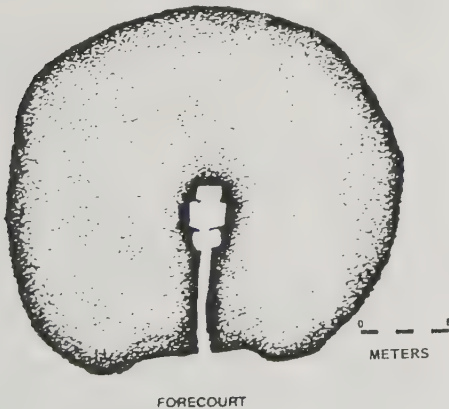
In a few cases, it appeared that some of the standing stones had been intentionally positioned to enhance the chamber's acoustical properties.

From an anomalist's standpoint, the most significant discovery was the apparent deliberate positioning of stones in the chamber to enhance the sound effects. Although they lacked all the equations of today's acoustical engineers, the Neolithic passage-grave builders

were obviously very observant and not averse to experimenting with chamber geometries to achieve certain effects.

X2. The Watson-Keating studies. A. Watson and D. Keating extended the investigations of Devereux and Jahn by examining a wide spectrum of passage graves to determine whether they could sustain standing waves. They also explored the possibility that some passage graves might serve as Helmholtz resonators in the infrasound range. In addition, they found that both standing waves and infrasound were associated with disconcerting physiological effects on humans in the chambers. These sensations, they surmised, might have been intentional on the part of the passage-grave designers. (R6)

Standing-wave research. Watson and Keating chose a passage grave named Camster Round for their standing-wave studies. Camster Round possesses a low, narrow passageway about 1 meter high and $\frac{1}{2}$ meter wide. This opens up first into an anteroom and then the main chamber which possesses a 3-meter-high ceiling. Standing waves were established by placing a tone generator in the main chamber. Human subjects experienced a range of peculiar sensations when the tone generator was operating, such as:



Plan of the Camster Round passage grave. Remarkable sound effects occur when a tone generator is operated in the chamber---both inside the structure and outside. (R6)

(1) Sound seemed to issue from different directions; sometimes, even within the percipient's head;

(2) Even small movements of the head caused large changes in volume and pitch; and

(3) Listeners in the chamber could detect movements in the passageway by changes in standing-wave patterns.

Such eerie effects would have been well-suited to complement ceremonials relating to the supernatural.

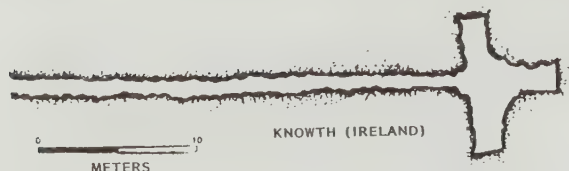
Perhaps the strangest effect of all those encountered at Camster Round was noticed when a drum was beaten in the chamber. Despite the open topography outside the entrance to Camster Round, the drum beats emanating from the chamber were not audible a scant 100 meters away. However, listeners in Camster Long, another passage grave 190 meters distant, did perceive a distant booming that seemed to rise from that chamber's floor. (R6)

This last effect might have been a sympathetic phenomenon involving the amplification of Camster Round's drum beats by resonance in Camster Long's appropriately tuned chamber. Such sophistication in acoustical engineering would indeed have been remarkable in Neolithic times---if intentional!

Helmholtz resonance. A well-known example of Helmholtz resonance occurs when one blows across the top of an empty bottle. Sound at the resonant frequency of the bottle is greatly amplified. The same effect may be created in the bottle-like configurations of the various passage-grave geometries. (See sketches.)

Watson and Keating did not have the proper equipment to demonstrate the existence of Helmholtz resonance in a real passage grave. So, they built a 1:10 model of Camster Round. Both acoustical theory and tests with the model proved that Camster Round would resonate at 4-5 Hertz. This frequency is in the infrasound range and cannot be detected as sound by humans. (Some other animals can "hear" infrasound.) Further calculations showed that several other passage graves can also resonate in the infrasound range. (R6)

One might reasonably ask, "So what?"



KNOWTH (IRELAND)



BALNUARAN (CLAVA, SCOTLAND)



QUANTERNESS (ORKNEY, SCOTLAND)

Several other passage graves for which resonant frequencies can be calculated. (R6)

The answer might have been: "To induce eerie human physiological sensations."

Some physiological effects of infrasound on humans. Although we cannot "hear" infrasound, we may be affected by it. Potential effects include: balance disturbances, pressure sensations in the ears, speaking difficulties, drowsiness, and headaches. If these phenomena accompanied rituals, along with the smell of incense and visual effects in a dark chamber, the overall impression could be weird and impressive to say the least.

Conclusions. Considering both the demonstrated effects of standing waves and the potential influences of Helmholtz resonances, Watson and Keating concluded:

While it cannot be demonstrated that the architecture of monuments was deliberately configured to enhance acoustic performance, the behaviour of sound would have been an unavoidable factor in their use. Perhaps acoustics should be regarded as an inseparable component in the genesis

of potent events, particularly as many of these compelling sound effects could not have been explained without our modern awareness of physics. In this respect acoustics should be considered alongside the structural, spatial, or visual attributes of ancient monuments. These places may not have been simply a technology for producing visual and acoustic experiences, but a means of creating different worlds altogether. (R6)

The acoustical design of passage graves, therefore, may have been used deliberately to enhance human contact with the transcendental---just as in the design of great cathedrals and seance rooms thousands of years later.

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PUBLICATIONS OF THE SOURCEBOOK PROJECT

The Sourcebook Project commenced publishing books describing the anomalies and curiosities of nature in 1974. Its primary wellspring of information has been the immense accumulation of scientific journals and books published over the past 200 years. The Project has proceeded in three phases:

- Phase I: Sourcebooks. (10 loose-leaf collections of reports with minimum commentary)
- Phase II: Handbooks. (6 hard-cover collections of reports greatly expanding upon the Sourcebooks, with more commentary and illustrations)
- Phase III: Catalogs. (19 hard-cover volumes to date, building upon the Sourcebooks and Handbooks. These books contain not only much more source material but also voluminous commentary, many more drawings and photographs, as well as detailed indexes)

The Handbooks and Catalogs still in print are described in depth in the following 8 pages under the heading: THE UNCLASSIFIED RESIDUUM.

Responding to continuing demand, nine of the ten Sourcebooks have been made available in photocopied form. These are described immediately following THE UNCLASSIFIED RESIDUUM.

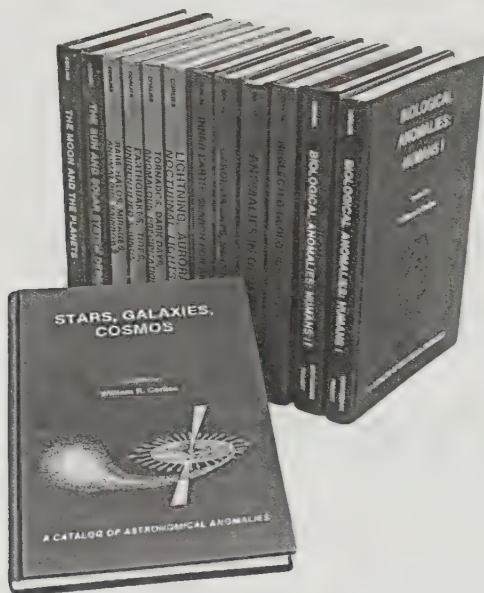
The Sourcebook Project has supplemented its formal publications with a series of relevant photocopied books and reports, as described on later pages.

THE UNCLASSIFIED RESIDUUM

THE UNCLASSIFIED RESIDUUM WAS DEFINED BY WILLIAM JAMES, THE GREAT AMERICAN PHILOSOPHER, IN THESE WORDS:

"ROUND ABOUT THE ACCREDITED AND ORDERLY FACTS OF EVERY SCIENCE THERE EVER FLOATS A SORT OF DUST-CLOUD OF EXCEPTIONAL OBSERVATIONS, OF OCCURRENCES MINUTE AND IRREGULAR AND SELDOM MET WITH, WHICH IT ALWAYS PROVES MORE EASY TO IGNORE THAN TO ATTEND TO. . . . ANYONE WILL RENOVATE HIS SCIENCE WHO WILL STEADILY LOOK AFTER THE IRREGULAR PHENOMENA. AND WHEN THE SCIENCE IS RENEWED, ITS NEW FORMULAS OFTEN HAVE MORE OF THE VOICE OF THE EXCEPTIONS IN THEM THAN OF WHAT WERE SUPPOSED TO BE THE RULES."

TO CLASSIFY THE UNCLASSIFIED RESIDUUM, THE SOURCEBOOK PROJECT IS COMPILING AN OBJECTIVE, UNSENSATIONALIZED CATALOG OF ANOMALOUS PHENOMENA.



The Catalog of Anomalies is in effect an encyclopedia of the unknown and puzzling. It is based upon recognized scientific research and is the only organized, indexed, unsensationalized collection of difficult-to-explain phenomena. The Catalog is supplemented by several "Handbooks" which contain more voluminous descriptions of phenomena.

(Left) The first thirteen volumes of the CATALOG OF ANOMALIES. (There are now eighteen volumes.) An incomparable collection of difficult-to-explain observations and curiosities of nature.

REVIEWS IN SCIENCE AND LIBRARY JOURNALS

The Catalogs and Handbooks have been favorably reviewed in many science journals, such as Nature, American Scientist, and New Scientist. In addition, library publications, such as Choice, Booklist, and Science Books, have recommended them. Four have been Book Club selections.

DATA BASE

Over 50,000 articles from the scientific literature ---the results of a 30-year search through more than 14,000 journal volumes, including the complete files of Nature, New Scientist, Science, Scientific American, and others.

USES FOR THE CATALOGS AND HANDBOOKS

- (1) Librarians will find these books to be unique collections of source material and bibliographies;
- (2) Scientists will find research ideas as well as unexpected observations and many references;
- (3) Students can use these volumes to develop research papers and theses; and
- (4) Science-oriented people everywhere will find thousands of natural mysteries that make science so exciting.

COMPILER

All Catalogs and Handbooks have been compiled by William R. Corliss.

ORDERING INFORMATION

Prices are in U.S. dollars. Canadian dollars and pounds sterling are accepted at prevailing exchange rates. U.S. customers should add \$1.50 to each order under \$30. Foreign customers should add \$2.00 per book for surface mail.

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Glen Arm, MD 21057-0107

BIOLOGY CATALOGS

BIOLOGICAL ANOMALIES: HUMANS I; A Catalog of Biological Anomalies

This volume, the first of three on human biological anomalies, looks at the "external" attributes of humans: (1) their physical appearance; (2) their anomalous behavior; and (3) their unusual talents and faculties.



*A Moi boy
with a
nine-inch
tail*

TYPICAL SUBJECTS COVERED

- Mirror-image twins
- The sacral spot
- The supposed human aura
- Baldness among musicians
- Human tails and horns
- Human behavior and solar activity
- Cycles of religiousness
- Cyclicality of violent collective human behavior
- Handedness and longevity
- Wolf-children
- The "Mars Effect"
- Telescopic vision
- Dermo-optical perception
- Hearing under anesthesia
- The human navigation sense
- Asymmetry in locomotion
- Sex-ratio variations

COMMENTS FROM REVIEWS

All I can say to Corliss is carry on cataloging.
NEW SCIENTIST

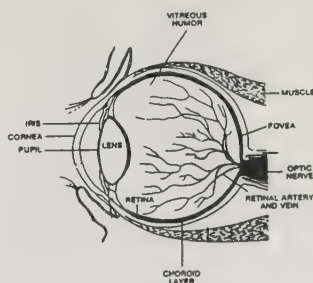
304 pages, hardcover, \$19.95
52 illus., 3 indexes, 1992
548 references, LC 91-68541
ISBN 0-915554-26-7, 7x10

BIOLOGICAL ANOMALIES: HUMANS II: A Catalog of Biological Anomalies

The second Catalog volume on human biological anomalies focusses upon the "internal" machinery of the body: (1) its major organs; (2) its support structure (the skeleton); and (3) its vital subsystems (the central nervous system and the immune system).

TYPICAL SUBJECTS COVERED

- Enigma of the fetal graft
- Phantom limbs
- Blood chimeras
- Anomalous human combustion
- Bone shedders
- Skin shedders
- "Perfection" of the eye
- Dearth of memory traces
- Sudden increase of hominid brain size
- Health and the weather
- Periodicity of epidemics
- Extreme longevity
- AIDS anomalies
- Cancer anomalies
- Human-limb regeneration
- Nostril cycling
- Voluntary suspended animation
- Male menstruation

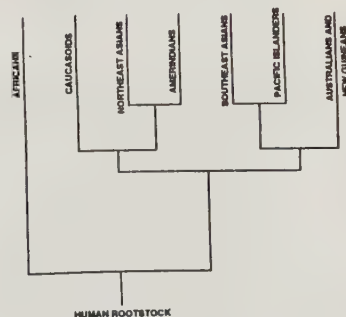


*Is the complexity of the
human eye anomalous?*

297 pages, hardcover, \$19.95
40 illus., 3 indexes, 1993
494 references, LC 91-68541
ISBN 0-915554-27-5, 7x10

BIOLOGICAL ANOMALIES: HUMANS III: A Catalog of Biological Anomalies

Completing our trilogy on human anomalies, this volume focuses on four areas: (1) the human fossil record; (2) biochemistry and genetics; (3) possible unrecognized living hominids; and (4) human interfaces with other species.



*DNA analysis divides modern
humans into these seven major
groups.*

TYPICAL SUBJECTS COVERED

- Neanderthal demise
- Giant skeletons
- Tiny skeletons
- Hominid gracilization
- Sudden brain expansion
- Human chimeras
- Sasquatch/Bigfoot, Alma, Yeti, and others
- Human-animal communication
- Humanity and Gaia
- Anomalous distribution of human lice

COMMENTS FROM REVIEWS

...some fascinating thinking
on the frontiers of science
BORDERLANDS

212 pages, hardcover, \$19.95
44 illus., 3 indexes, 1994
311 references, LC-68541
ISBN 0-915554-29-1, 7x10

BIOLOGY CATALOGS

BIOLOGICAL ANOMALIES: MAMMALS I: A Catalog of Biological Anomalies

The first three biology catalogs deal with human anomalies. Here, we attend to the "other" mammals, and two volumes will be required. This, the first, parallels *Humans I* by dealing with external attributes: (1) physical appearance; (2) behavior; and (3) talents and faculties.

TYPICAL SUBJECTS COVERED

- Mammal-marsupial parallelisms
- Zebra-stripe reversals
- Marching teeth
- Lunar effect on activity
- Mammalian art and music
- Rat and squirrel "kings"
- Cetacean mass strandings
- Mummified Antarctic seals
- Navigation and homing
- Soaring and parachuting
- Mammalian engineering works
- Deep-diving capabilities
- Unusual vocalizations
- Intelligence overshoot



A yapok. A South American aquatic marsupial. The female possesses a watertight pouch. Strangely, the male also has a pouch.

292 pp., hardcover, \$21.95
84 illus., 3 indexes, 1995
546 references, LC 91-68541
ISBN 0-915554-30-5, 7x10

BIOLOGICAL ANOMALIES: MAMMALS II: A Catalog of Biological Anomalies

Our fifth biology catalog completes our study of mammalian anomalies. This volume parallels *Humans II* and *III* with major sections on the fossil record and cryptozoology. In addition, there are shorter sections on genetics, organs, bodily functions, and interactions between mammals and other life forms.



The "king cheetah" has stripe-like markings instead of spots. Its fur is thicker and silkier. A new species emerging?

TYPICAL SUBJECTS COVERED

- Biochemical curiosities
- Recent survivals of the mammoth, ground sloth, thylacine
- Out-of-place mammals
- Dearth of transitional fossils
- Diving-mammal adaptations
- Male lactation
- Sleeplessness in mammals
- Inheritance of rotation effects
- Magnetite in mammals
- Microbat data processing
- The onza, nandi bear, Steller's sea ape, and others

COMMENTS FROM REVIEWS

Essential for all libraries, schools and serious Forteanists.
FORTEAN TIMES

324 pp., hardcover, \$21.95
89 illus., 3 indexes, 1996
527 references, LC 91-68541
ISBN 0-915554-31-3, 7x10

BIOLOGICAL ANOMALIES: BIRDS: A Catalog of Enigmas and Curiosities

Birds are everywhere: some can fly high over the Himalayas, others can dive as deep as 500 meters in the ocean, some migrate unerringly from one end of the earth to the other. With more than 9,000 species recognized, birds present us with hundreds of scientific puzzles to solve.

TYPICAL SUBJECTS COVERED

- Asymmetrical birds
- Wing claws and spurs
- Inherited callosities
- Unrelated birds that look alike
- Enigmas of avian instincts
- The intelligence of birds
- An avian aesthetic sense?
- Birds that roost upside-down
- The insidious nature of brood parasitism
- Avian battles, courts, funerals
- Unsolved mysteries of migration
- Poisonous birds
- The unique avian respiratory system
- The two-voice phenomenon
- Echolocation in birds



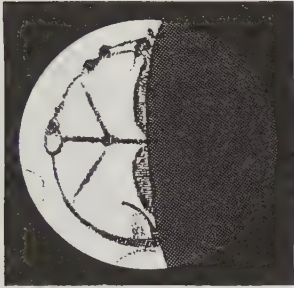
The Hoopoe is a strikingly patterned Old World bird that repels predators with a smelly glandular secretion.

486 pages, hardcover, \$27.50
150 illus., 3 indexes, 1998
1170 references, LC 91-68541
ISBN 0-915554-32-1, 7 x 10

ASTRONOMY CATALOGS

THE MOON AND THE PLANETS; A Catalog of Astronomical Anomalies

From our own moon's cratered surface to the red, rock-strewn plains of Mars, the Solar System is a fertile field for anomaly research. Despite centuries of observation, each new spacecraft and telescope provides us with new crops of mysteries.



One drawing of the Venusian radial-spoke system

TYPICAL SUBJECTS COVERED

- The ashen light of Venus
- The "face" on Mars
- Kinks in Saturn's rings
- Debates about the Voyager life-detection experiment
- Neptune's mysterious ring
- Evidence of water on Mars
- The strange grooves of Phobos
- Mars' topographic dichotomy
- Lunar clouds, mists, "weather"
- New-moon ring of light
- Dark transits of Jovian moons
- Io's energetic volcanos
- Jupiter as a "failed star"
- Earth-Venus resonance

COMMENTS FROM REVIEWS

The author is to be commended for his brilliantly conceived and researched volume.
SCIENCE BOOKS & FILMS

383 pp., hardcover, \$18.95
80 illus., 4 indexes, 1985
988 references, LC 85-61380
ISBN 0-915554-19-4, 7x10

THE SUN AND SOLAR SYSTEM DEBRIS; A Catalog of Astronomical Anomalies

Our sun, powerhouse of the solar system and an enigma itself, is orbited by clouds of asteroids, comets, meteors, and space dust. These "minor objects" pose major problems to astronomers regarding their origin and constitution.

TYPICAL SUBJECTS COVERED

- Solar-system resonances
- Bode's Law, other regularities
- Blackness of comet nuclei
- Cometary activity far from the sun
- Unidentified objects crossing the face of the sun
- The "missing" solar neutrinos
- Pendulum phenomena during solar eclipses
- Observations of Planet X
- Meteorite-distribution anomalies
- Lunar and Martian meteorites
- Long fireball processions
- Long-duration meteors
- Zodiacal-light changes



One of the many possible modes of solar-surface oscillation

COMMENTS FROM REVIEWS

It is an unusual book, nicely executed, and I recommend it highly. ICARUS

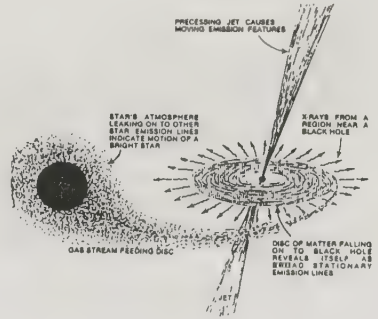
288 pp., hardcover, \$17.95
66 illus., 4 indexes, 1986
874 references, LC 86-60231
ISBN 0-915554-20-8, 7x10

STARS, GALAXIES, COSMOS; A Catalog of Astronomical Anomalies

Did the Big Bang really begin the existence of all we know? Do we honestly know how the stars (and our sun) work? Can we always rely on Newton's Law of Gravitation? According to this volume, the answer seems to be: "Probably not!"

TYPICAL SUBJECTS COVERED

- Optical bursters, flare stars
- Color changes of Sirius
- Infrared cirrus clouds
- Quasar-galaxy associations
- The red-shift controversy
- Quantization of red shifts
- The quasar energy paradox
- Superluminal phenomena in galaxies and quasars
- Evidence for universal rotation
- Swiss-cheese structure of cosmos
- Is the "missing mass" really missing?
- Superluminous infrared galaxies
- Shells around elliptical galaxies



Model of the mysterious star SS 433

COMMENTS FROM REVIEWS

...it never fails to be interesting, challenging and stimulating. NEW SCIENTIST

246 pp., hardcover, \$17.95
50 illus., 4 indexes, 1987
817 references, LC 87-60007
ISBN 0-915554-21-6, 7x10

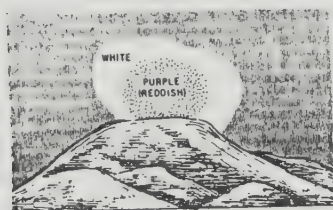
GEOPHYSICS CATALOGS

LIGHTNING, AURORAS, NOCTURNAL LIGHTS; A Catalog of Geophysical Anomalies

Nothing catches the human eye and imagination as quickly as a mysterious light. All down recorded history, scientists and laymen alike have been seeing strange lightning, sky flashes, and unaccountable luminous objects.

TYPICAL SUBJECTS COVERED

- Horizon-to-horizon sky flashes
- Episodes of luminous mists
- Mountain-top glows
- Earthquake lights
- Ball lightning with tails
- Rocket lightning
- Lightning from a clear sky
- Ghost lights, ignis fatuus
- Darting streaks of light (sleeks)
- The milky sea and light wheels
- Radar-stimulated phosphorescence of the ocean
- Double ball lightning
- Luminous phenomena in tornadoes
- Black auroras



Luminous display over Mt. Noro-shi during an earthquake storm

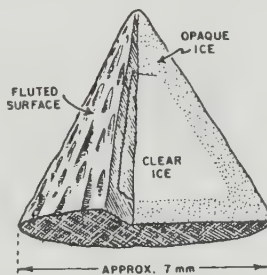
COMMENTS FROM REVIEWS

...the book is well-written and in places quite fascinating.
SCIENCE BOOKS & FILMS

248 pp., paper, \$16.95p
74 illus., 5 indexes, 1982
1070 references, LC 82-99902
ISBN 0-91554-09-7, 7x10

TORNADOS, DARK DAYS, ANOMALOUS PRECIPITATION; A Catalog of Geophysical Anomalies

Here is our "weather" Catalog. As everyone knows, our atmosphere is full of tricks: chunks of ice fall from the sky, tornado funnels glow at night, etc. The TV weather programs rarely mention these "idiosyncracies."



Conical hailstones with fluted sides

TYPICAL SUBJECTS COVERED

- Polar-aligned cloud rows
- Ice fogs (the Pogonip)
- Conical hail
- Gelatinous meteors
- Point rainfall
- Unusual incendiary phenomena
- Solar activity and thunderstorms
- Tornado electricity
- Multiwalled waterspouts
- Explosive onset of whirlwinds
- Dry fogs and dust fogs
- Effect of moon on rainfall
- Ozone in hurricanes
- Ice falls (hydrometeors)

COMMENTS FROM REVIEWS

...can be recommended to everyone who realizes that not everything in science has been properly explained. WEATHER

202 pp., hardcover, \$16.95
40 illus., 5 indexes, 1983
745 references, LC 82-63156
ISBN 0-915554-10-1, 7x10

EARTHQUAKES, TIDES, UNIDENTIFIED SOUNDS; A Catalog of Geophysical Anomalies

Earthquakes, monster solitary waves, and natural detonations; these are the consequences of solids, liquids, and gases in motion. In our modern technological cocoon, we are hardly aware of this rich spectrum of strange natural phenomena.



Sand craters created by earthquakes

TYPICAL SUBJECTS COVERED

- Periodic springs, blowing caves
- Sun-dominated tides
- Immense, solitary waves
- Animal activity prior to earthquakes
- Earthquake geographical anomalies
- Earthquake electricity
- The sound of the aurora
- Musical sounds in nature
- Mysterious detonations
- Anomalous echos
- Slicks and calms on water surface
- Earthquake periodicities
- The vibrations of waterfalls
- Unusual barometric disturbances

COMMENTS FROM REVIEWS

...surprisingly interesting reading. NATURE

220 pp., paper, \$16.95p
32 illus., 5 indexes, 1983
790 references, LC 83-50781
ISBN 0-915554-11-9, 7x10

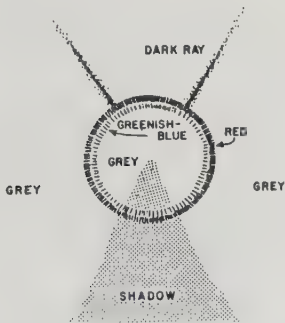
ARCHEOLOGY CATALOG

RARE HALOS, MIRAGES, ANOMALOUS RAINBOWS; A Catalog of Geophysical Anomalies

Most of us have seen rings around the moon, but what does it mean when such rings are not circular or are off-center? Neither are rainbows and mirages devoid of mysteries. And the Brocken Specter still startles Alpine climbers!

TYPICAL SUBJECTS COVERED

- Rainbows with offset white arcs
- Sandbows
- Offset and skewed halos
- The Brocken Specter
- The Alpine Glow
- Unexplained features of the green flash
- Fata Morganas
- Telescopic mirages
- Long-delayed radio echos
- Eclipse shadow bands
- Geomagnetic effect of meteors
- Intersecting rainbows
- The Krakatoa sunsets
- Kaleidoscopic suns



*Shadow of Adam's Peak with
glory and radial rays*

COMMENTS FROM REVIEWS

...all in all it's a fascinating
book. SKY & TELESCOPE
...any student of the physical
sciences will find it fascinating.
SCIENCE BOOKS & FILMS

244 pp., hardcover, \$16.95
111 illus., 5 indexes, 1984
569 references, LC 84-50491
ISBN 0-915554-12-7, 7x10

ANCIENT INFRASTRUCTURE: Remarkable Roads, Mines, Mounds, Stone Circles

Ancient peoples raised standing stones on all continents save Antarctica. They dug canals 50 miles long and erected even longer walls. Gleaned from hundreds of volumes of *Science*, *Nature*, *Antiquity*, and other science journals, this massive collection of archeological puzzles will keep researchers digging for decades.



*The Haamonga Stones resemble
Stonehenge but they are found
on palm-dotted Tonga in the South
Pacific. But they may have also
been used by ancient astronomers.*

- Costa Rica's enigmatic stone spheres
- Peru's Intervalley Canal
- Iraq's 100,000 miles of subterranean tunnels (the qanats)
- Nova Scotia's "Money Pit"
- Egypt's canal to the Red Sea
- North America's calendar sites
- Medicine wheels and woodhenges
- Sculpted hills and mountains
- Chaco Canyon's curious roads
- The puzzling East Bay walls
- Lake Superior's copper mines
- Stone arrays and meanders
- Florida's shell keys
- Poverty Point and Watson Brake
- Malta's strange "cart ruts"

412 pages, hardcover, \$24.95
255 illus., 3 indexes, 1999
855 references, LC 99-94987
ISBN 0-915554-33-x, 7 x 10

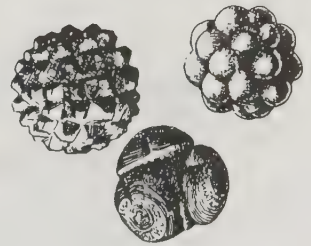
ARCHEOLOGY HANDBOOK

ANCIENT MAN; A Handbook of Puzzling Artifacts

Now in its fifth printing, our archeology Handbook reproduces hundreds of fascinating items from difficult-to-obtain archeological journals.

TYPICAL SUBJECTS COVERED

- Ancient Florida canals
- The Maltese "cart tracks"
- New England earthworks
- Ancient coins in America
- Ancient Greek computer
- Inscriptions and tablets in unexpected places
- The great Tiahuanaco ruins
- Zimbabwe and Dholo-dhlo
- Costa Rica stone spheres
- The Great Wall of Peru
- Ancient batteries and lenses
- Mysterious walls everywhere
- Pacific megalithic sites
- Scottish fused forts



*Scottish carved stones from
circa 1000 B.C.*

COMMENTS FROM REVIEWS

...a useful reference in undergraduate, public, and high school libraries. BOOKLIST

792 pp., hardcover, \$23.95
240 illustrations, index, 1978
References, LC 77-99243
ISBN 0-915554-03-08, 6x9

GEOLOGY CATALOGS

CAROLINA BAYS, MIMA MOUNDS, SUBMARINE CANYONS; A Catalog of Geological Anomalies

Topographical phenomena are the subject of this Catalog. The ups and downs of the earth's surface exhibit many anomalies. Could continental drift be inferior to the expanding-earth hypothesis? Have ocean levels fluctuated wildly down the eons?

TYPICAL SUBJECTS COVERED

- Carolina bays and oriented lakes
- Large circular structures
- Immense craters
- Raised beaches
- Guyots (flat-topped seamounts)
- Island arcs
- Doubts about plate tectonics (continental drift)
- Mima mounds
- Drumlin anomalies
- Patterned ground
- Esker problems
- Lake walls and ramparts
- Crevicular structure
- Submarine canyons



Pyramid of frozen foam on the Bozenkill, New York State

COMMENTS FROM REVIEWS

...enough terrestrial intrigue to keep us thinking for years.
PURSUIT

245 pp., hardcover, \$17.95
84 illus., 5 indexes, 1988
682 references, LC 87-63408
ISBN 0-915554-22-4, 7x10

ANOMALIES IN GEOLOGY: PHYSICAL, CHEMICAL, BIOLOGICAL; A Catalog of Geological Anomalies

Journey here into ice caves, exhume Siberian mammoths, see animals perish in gas-filled valleys---a little media hype is justified here. But more serious questions posed in this volume include the origins of oil, coal, and natural gas.

TYPICAL SUBJECTS COVERED

- Biological-extinction events
- Musical sands, ringing rocks
- Questions about oil's origin
- Ice caves, frozen wells
- Natural fission reactors
- Marine organisms and fossils found far inland
- Siberia's frozen mammoths
- Radiometric-dating problems
- Anchor ice, frazil ice
- Violent lake turnovers
- Flexible rocks
- Origin of the oceans
- Skipping in the fossil record
- Valleys of death

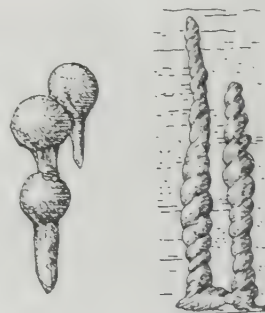


Prismatic sandstone from Missouri

335 pp., hardcover, \$18.95
55 illus., 5 indexes, 1989
1260 references, LC 89-90680
ISBN 0-915554-23-2, 7x10

NEGLECTED GEOLOGICAL ANOMALIES; A Catalog of Geological Anomalies

Neglected but far from insignificant are the anomalies cataloged here. Do we really know how concretions and geodes form, where natural glasses come from, and whence the immense deposits of superficial debris found all over the globe?



Mace-shaped and sand-spike concretions from the Colorado Delta

TYPICAL SUBJECTS COVERED

- Concretions and geodes
- Tektites and microtektites
- Erratic boulders and gravels
- Polystrate fossils
- Bone caves and bone beds
- Giant basalt flows
- Natural glasses
- Surging glaciers
- Driftless regions
- Stretched pebbles
- Inclusions in crystals
- Rarity of fossil meteorites and tektites
- Elevated erratics
- Stone rivers, rock glaciers

333 pp., hardcover, \$18.95
80 illus., 5 indexes, 1990
1030 references, LC 90-60568
ISBN 0-915554-24-0, 7x10

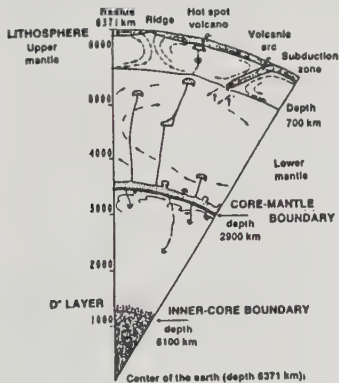
ASTRONOMY HANDBOOK

INNER EARTH: A SEARCH FOR ANOMALIES; A Catalog of Geological Anomalies

The focus of this, the eleventh volume in the Catalog of Anomalies, is the earth's interior, which is revealed to us mainly through seismic signals, magnetic variations, and the flow of heat from great depths. Hundreds of kilometers below the surface lurk huge chunks of foundered continental crust and bizarre structures of unknown origin.

TYPICAL SUBJECTS COVERED

- Anomalous gravity signals
- Mid-plate volcanism
- Mysterious seismic reflectors
- Seismic-velocity discontinuities
- Deep-focus earthquakes
- Incompleteness of the stratigraphic record
- Cyclothem and rhythmites
- Exotic terranes
- Compass anomalies
- Earth-current anomalies
- Problems with paleomagnetism
- Polarity reversals

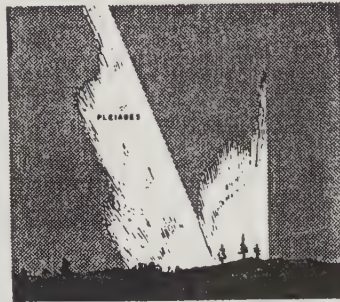


A model of the earth's interior

230 pp., hardcover, \$18.95
52 illus., 5 indexes, 1991
619 references, LC-90-92347
ISBN 0-915554-25-9, 7x10

MYSTERIOUS UNIVERSE; A Handbook of Astronomical Anomalies

Our astronomy Handbook covers much the same ground as the three astronomy Catalogs just described, but in greater depth---the quotations are more extensive.



*Unexplained rift in the
zodiacal light*

TYPICAL SUBJECTS COVERED

- The lost satellite of Venus
- Transient lunar phenomena
- Ephemeral earth satellites
- Venus' radial spoke system
- Relativity contradicted
- Cosmological paradoxes
- Changes in light's velocity
- Vulcan, the intramercurial planet
- Knots in Saturn's rings
- Bright objects near the sun
- The sun's problematical "companion star"
- "Sedimentary" meteorites
- Life chemistry in outer space
- Sunspots and planetary positions

COMMENTS FROM REVIEWS

...highly recommended...excellent value for money. NATURE
(Astronomy Book Club selection)

716 pp., hardcover, \$19.95
103 illus., index, 1979
References, LC 78-65616
ISBN 0-915554-05-4, 6x9

SCIENCE FRONTIERS: Some Anomalies and Curiosities of Nature

An indexed compilation of the first 86 issues of our newsletter SCIENCE FRONTIERS.

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Information Processing	305
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Chapter 7. CHEMISTRY, PHYSICS, MATH, ESOTERICA

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Esoterica	333

COMMENTS FROM REVIEWS

This fun-to-read book may lead some to new scientific solutions through questioning the phenomena presented. SCIENCE BOOKS & FILMS

356 pp., paperback, \$18.95p
417 illus., index, 1994
1500+ references, LC 93-92800
ISBN 0-915554-28-3, 8½x11

PHASE-I SOURCEBOOKS

Nine of the ten of the Phase-I Source books are available in photocopied form housed in sturdy 3-ring binders. The binders are color-coded and hand-labeled on their spines.

STRANGE PHENOMENA: A Sourcebook of Unusual Natural Phenomena

Vol. G1, 1974, 283 pp. \$16.95
Vol. G2, 1974, 270 pp. \$16.95

●The Luminous Portents of Earthquakes;
●Ball Lightning; ●The Andes Glow; ●How Earthquakes Affect Animals; ●The Barisal Guns and Similar Sounds; ●Texas Ghost Light; ●Lightning from a Cloudless Sky; ●Luminous Wheels Puzzle Seamen; ●Yellowstone Lake Whispers; ●Shower of Fish; ●Sound of the Aurora; ●Explosive Hail; ●Mistpouffers in the Philippines

STRANGE UNIVERSE: A Sourcebook of Curious Astronomical Observations

Vol. A1, 1975, 285 pp. \$16.95
Vol. A2, 1977, 288 pp. \$16.95

●Swift's Forecast of Mars' Satellites;
●Vulcan and Bode's Law; ●Brilliant Object Seen near the Sun; ●Huth's "Moving Star" of 1801-2; ●Signals from Mars; ●Lightning-Like Phenomena on the Moon; ●Sunspots and the Planets; ●Has the Moon a Satellite? ●Comet Lore; ●Volcanoes and the Solar Cycle; ●Dark Meteors; ●Explanation of the Supposed Signal from Mars of December 7 and 8, 1900.

STRANGE MINDS: A Sourcebook of Unusual Mental Phenomena

Vol. P1, 1976, 291 pp. \$16.95

●Arithmetical Prodigies; ●Automatic Writing: Its Uses and Verification; ●Singing Idiots; ●Epidemic Convulsions; ●A Case of Possession; ●Dream Murders; ●Fire-Walking: Scientific Tests; ●Dowsing Experiments; ●Voodoo, Rootwork, and Medicine; ●A Prodigy of Memory; ●Apparitions; ●Angels and UFOs; ●The Ringing of Housebells without Apparent Cause; ●Faith and Healing

STRANGE ARTIFACTS: A Sourcebook on Ancient Man

Vol. M1, 1974, 268 pp. \$16.95
Vol. M2, 1976, 293 pp. \$16.95

●The Secret of Stonehenge; ●Cupmarks; ●Easter Island; ●An Ancient Roman Settlement in America; ●The Problem of the Rhodesian Ruins; ●The Mexican Messiah; ●Ancient Canals in Nevada; ●Human Skeletons with 36 Teeth; ●Observations on the Vitrified Walls in Scotland; ●Ancient Works in New York; ●Mayan Roads; ●The Spanish Diggings; ●The Great Wall of Peru

STRANGE PLANET: A Sourcebook of Unusual Geological Facts

Vol. E1, 1975, 289 pp. \$16.95
Vol. E2, 1978, 269 pp. \$16.95

●The Mammoth and the Flood; ●The Great Dinosaur Disaster; ●A Toad in the Solid Rock; ●A Dry Quicksand; ●Legendary Islands of the North Atlantic; ●Why the Rocks Ring; ●Mystery Imprints Stump Geologists; ●A New Magnetic Reversal at 12,500 Years? ●Upside-Down Strata; ●The Mystery of the Mima Mounds; ●When the Mediterranean Dried up; ●Erupting Boulders

PHOTOCOPIED CLASSIC BOOKS

Some important old books from the anomaly literature have been photocopied and bound in heavy, printed covers. Format: 8½ x 11. Order by author.

ANCIENT MONUMENTS OF THE MISSISSIPPI VALLEY

E.G. Squier and E.H. Davis,
376 pp., 1848, \$29.95p

One of the most remarkable archeological books ever published in America! Its appearance in 1848 created a great sensation. For, as America moved west, the remnants of the great civilization of the Moundbuilders raised much speculation. Even today we marvel at their immense, flat-topped temple mounds, the huge earthen enclosures, and the meticulously wrought artifacts of copper, mica, and clay. Squier and Davis objectively described the features of this New World civilization in words and drawings. It is the drawings, though, that really capture the reader. They are superb, almost overwhelming.

RUDE STONE MONUMENTS IN ALL COUNTRIES: Their Age and Uses

J. Fergusson, 1872, 578 pp., \$26.95p

Fergusson's famous compilation of worldwide megalithic monuments is a fit complement to our photocopied edition of Ancient Monuments of the Mississippi Valley, from 1848. Fergusson has filled his book with 233 line drawings of artifacts from the megalithic period. The emphasis is on the massive monuments, but you'll also see some sketches of pottery and inscribed stones. Naturally, there are long chapters on the British Isles, Ireland, and Europe; but the author also demonstrates how the megalithic culture extended into North Africa, the Middle East, and India. It is a pleasure to page through this old classic and read how our parents' parents interpreted these edifices.

ABORIGINAL MONUMENTS OF THE STATE OF NEW YORK

E.G. Squier, 1849, 193 pp., \$18.95p

With the help of 72 figures and 14 large plates, Squier details the abundant aboriginal works found in New York and elsewhere. Included are chapters on mounds and other earthworks as well as implements and ornaments. The long appendix leaves New York and delves into the fortifications of the ancient Mexicans and Peruvians, the aboriginal use of copper, and some ancient works found in Pennsylvania and New Hampshire.

ABORIGINAL REMAINS OF TENNESSEE

J. Jones, 1880, 176 pp., \$18.95p

A comprehensive study-in-depth of the legacy of the Tennessee aborigines, with 85 excellent illustrations and index. Topics include: burial caves (as seen by their discoverers), pyramidal and conical mounds, fortifications, earthworks, the famous Stone Fort, and a wide variety of artifacts. Jones also studied the so-called pigmy graves and tiny stone coffins.

LEGENDARY ISLANDS OF THE ATLANTIC

W.H. Babcock, 196 pp., 1922, \$14.95p

The title of this book immediately conjures up thoughts of Atlantis; but many other Atlantic islands were once thought to exist, were placed on maps, and then disappeared. The island of Brazil (or Hy Brazil) is one of these phantom islands. Babcock has written an engrossing, scholarly treatise, with many old maps, and hints of pre-Columbian contacts with the New World. Here follow some chapter titles: ●Atlantis; ●The Island of the Seven Cities; ●The Problem of Mayda; ●Estotiland and the Other Islands of Zeno; ●The Sunken Land of Buss and Other Phantom Islands.

THE MAMMOTH AND THE FLOOD: An Attempt to Confront the Theory of Uniformity with the Facts of Recent Geology
H.H. Howorth, 1887, 498 pp., \$23.50p

Sir Henry Howorth was one of the great synthesizers of science in the late 1800s. In this book, he brought together all of the available evidence on recent catastrophic flooding on the earth: the bone caves, the Siberian mammoth carcasses, the masses of fresh moa bones in Australia, and host of other geological and biological puzzles. Most of Howorth's attention, however, is focussed on the mammoths and their recent demise. This book is one of the classics of catastrophe literature.

EVOLUTIONARY GEOLOGY AND THE NEW CATASTROPHISM

G.M. Price, 1926, 352 pp., \$18.95p

Price was an early catastrophist at a time when uniformitarianism ruled with an iron fist. He systematically and rationally presented some of geology's major anomalies---particularly in stratigraphy. Chapter titles include: ●The Modern Onion-Coat Theory; ●"Deceptive Conformity"; ●Upside Down; ●Extinct Species; ●Skipping; ●Graveyards; ●Degeneration; ●Fossil Men.

Price was a creationist, but his book is devoid of theology.

THE AERIAL WORLD

G. Hartwig, 1886, 560 pp., \$26.95p

Even though this title is over a century old, it is still a pleasure to read. Its 37 chapters touch on just about every facet of weather and geophysics known: ●The echo; ●Waterspouts; ●The Rainbow; ●The thunderstorm; ●St. Elmo's fire; and even flying machines, such as they were in 1886! There are hundreds of anecdotes and descriptions of curious phenomena, such as: ●Remarkable echoes in Siberia; ●Luminous dust; ●Elf Candles; ●The 1838 Spout of Calcutta, and ●Moon blindness. It is a classic collection of geophysical anomalies and curiosities.

PHOTOCOPIED CLASSIC REPORTS

Several hard-to-find old reports from the scientific literature are available in photocopied form. These are housed in plastic or cardboard folders, except for Emel'yanov's short report. Order by author.

THE NEW MADRID EARTHQUAKE

M.L. Fuller, U.S. Geological Survey Bulletin 494, 1912, 119 pp., \$9.00p

A meticulous account of the great cataclysms of 1811-1812, including many eye-witness accounts of remarkable geological and geophysical phenomena. Fuller also presented a scientific analysis of the cataclysmic shocks.

CHRONOLOGICAL CATALOG OF REPORTED LUNAR EVENTS

B.M. Middlehurst, et al; NASA Technical Report R-277, 1968, 59 pp., \$8.00p

An exhaustive descriptive catalog of 579 transient lunar phenomena, with complete references. 59 pp., \$8.00.

OBSERVATIONS ON THE METEORS OF NOVEMBER 13TH, 1833

D. Olmsted, American Journal of Science, 1:25:363, 1834, 90 pp., \$7.00p

One of the greatest meteor showers of historical times lit up the skies of North America in 1833. This report records many eye-witness accounts of unusual and spectacular phenomena.

ORIGIN OF THE BROWN MOUNTAIN LIGHTS IN NORTH CAROLINA

G.R. Mansfield, George Rogers; U.S. Geological Survey Circular 646, 1971, 18 pp., \$4.00p

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W.L. McAtee, Waldo L.; Monthly Weather Review, 45:217, 1917. RAINS OF FISHES, E.W. Gudger, Natural History, 21:607, 1921. 21 pp., \$4.00p

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Yu. M. Emel'yanov, Report from the V.V. Kuybyshev State University. We had this report translated. 8 pp., \$3.00p

The analysis of this phenomenon suggests an encounter between the earth and a dense cloud of cosmic dust.

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